

THIS REPORT HAS BEEN DELIMITED
AND CLEARED FOR PUBLIC RELEASE
UNDER DOD DIRECTIVE 5200.20 AND
NO RESTRICTIONS ARE IMPOSED UPON
ITS USE AND DISCLOSURE.

DISTRIBUTION STATEMENT A

APPROVED FOR PUBLIC RELEASE;
DISTRIBUTION UNLIMITED.

UNCLASSIFIED

AD _____

*Reproduced
by the*

ARMED SERVICES TECHNICAL INFORMATION AGENCY
ARLINGTON HALL STATION
ARLINGTON 12, VIRGINIA



DOWNGRADED AT 3 YEAR INTERVALS:
DECLASSIFIED AFTER 12 YEARS
DOD DIR 5200.10

UNCLASSIFIED

Armed Services Technical Information Agency

Because of our limited supply, you are requested to return this copy WHEN IT HAS SERVED YOUR PURPOSE so that it may be made available to other requesters. Your cooperation will be appreciated.

AD

41778

NOTICE: WHEN GOVERNMENT OR OTHER DRAWINGS, SPECIFICATIONS OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE U. S. GOVERNMENT THEREBY INCURS NO RESPONSIBILITY, NOR ANY OBLIGATION WHATSOEVER; AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS, OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

Reproduced by
DOCUMENT SERVICE CENTER
KNOTT BUILDING, DAYTON, 2, OHIO

AD No. 41 778
ASTIA FILE COPY

This document has been reviewed in accordance with
OPNAVINST 5510.17, paragraph 5. The security
classification assigned hereto is correct.

Date: 7/27/54 D. A. Smith
By direction of
Chief of Naval Research (Code 451)

PERSONNEL STUDIES IN MINE WARFARE

TECHNICAL REPORT—PART V

CRITERION DEVELOPMENT FOR THE MINEMAN BILLET

By:

WILLIAM S. BARKER
MILTON H. IREDELL
HARRY J. OLDER

A RESEARCH PROJECT CONDUCTED FOR THE BUREAU OF
NAVAL PERSONNEL UNDER CONTRACT Nonr 902 (00).
PRA REPORT 54-4 • APRIL 1954

PSYCHOLOGICAL RESEARCH ASSOCIATES
1025 CONNECTICUT AVENUE, NORTHWEST
WASHINGTON 6, D. C.

54AA

51028

CONFIDENTIAL

PERSONNEL STUDIES IN MINE WARFARE

TECHNICAL REPORT - PART V
CRITERION DEVELOPMENT FOR THE MINEMAN BILLET

By:

WILLIAM S. BARKER
MILTON H. IREDELL
HARRY J. OLDER

A RESEARCH PROJECT CONDUCTED FOR THE BUREAU
OF NAVAL PERSONNEL UNDER CONTRACT NONR 902 (00)
PRA REPORT 54-4 APRIL 1954

THE OPINIONS OR ASSERTIONS CONTAINED HEREIN ARE THE
PRIVATE ONES OF THE WRITERS AND ARE NOT TO BE CON-
STRUED AS OFFICIAL OR REFLECTING THE VIEWS OF THE
DEPARTMENT OF THE NAVY OR THE NAVAL SERVICE AT LARGE.

PSYCHOLOGICAL RESEARCH ASSOCIATES
1025 CONNECTICUT AVENUE, N. W.
WASHINGTON, 6, D. C.

CONFIDENTIAL

54A1 1028

CONFIDENTIAL

TABLE OF CONTENTS

<u>CHAPTER</u>		<u>PAGE</u>
	LIST OF TABLES AND FIGURES . . . . .	.iii
	ACKNOWLEDGEMENTS	v
	A BRIEF SUMMARY OF THIS REPORT	viii
I	INTRODUCTION	1
II	THE NEED FOR AND CHARACTERISTICS OF A CRITERION	4
III	PLANNING THE CRITERION MEASURE	8
IV	CONSTRUCTION OF THE CRITERION MEASURE	21
V	PREPARATION FOR CRITERION ADMINISTRATION	26
VI	OVERVIEW OF THE CRITERION STATIONS	31
VII	RESULTS OF THE ADMINISTRATION OF THE CRITERION MEASURE	63
 <u>APPENDIX</u>		
A	RAW DATA ON INDIVIDUAL MINEMEN BY PAY GRADE	70
B	SCORING FORMS AND ITEM INFORMATION	76
C	STATISTICAL DATA	147

CONFIDENTIAL

CONFIDENTIAL

LIST OF TABLES

<u>TABLE</u>		<u>PAGE</u>
1	MEANS AND STANDARD DEVIATIONS BY PAY GRADE . . . . .	.64
2	CORRELATIONS OF STATION AND DIAGNOSTIC SCALE SCORES WITH TOTAL SCORE AND STATION INTER- CORRELATIONS	150
3	SUMMARY OF THE LEVEL OF SIGNIFICANCE OF ITEMS MAKING UP THE STATIONS OF THE CRITERION MEASURE. . .	151

LIST OF FIGURES

<u>FIGURE</u>		<u>PAGE</u>
1	BATTERY LOAD TEST - STATION 1. . . . .	.37
2	M-11 SCHEMATIC READING - STATION 2 . . . . .	.40
3	CD-14 SETTING - STATION 3 . . . . .	.43
4	TUBE STRAP MANUFACTURE - STATION 4 . . . . .	.46
5	M-5 FIRING MECHANISM - STATION 5 . . . . .	.49
6	A-8 FIRING MECHANISM - STATION 6 . . . . .	.52
7	SOLDERING - STATION 7. . . . .	.55
8	OPERATIONAL TEST, MINE MK 36-1 - STATION 8 . . . . .	.58
9	BUTTON UP - STATION 9. . . . .	.61
10	GRAPH - CRITERION MEANS FOR EACH PAY GRADE . . . . .	.66
11	GRAPH - DIAGNOSTIC SCALE MEANS FOR EACH PAY GRADE. .	.68

CONFIDENTIAL

CONFIDENTIAL

LIST OF FIGURES (CON'T.)

<u>FIGURE</u>		<u>PAGE</u>
12	BREADBOARDS EMPLOYED AT STATION 2	95
13	WIRING DIAGRAMS OF BREADBOARDS EMPLOYED AT STATION 2. . .	96

CONFIDENTIAL

CONFIDENTIAL

ACKNOWLEDGEMENTS

WHILE CONDUCTING THE RESEARCH REPORTED HEREIN, PSYCHOLOGICAL RESEARCH ASSOCIATES RECEIVED ASSISTANCE FROM VARIOUS SOURCES. WE WISH TO EXPRESS OUR THANKS TO THE INDIVIDUALS WHO MADE A CONTRIBUTION TO THIS STUDY.

FIRST OF ALL, THANKS ARE DUE TO THE MAN WHO CONTRIBUTED AT EVERY STEP OF THE RESEARCH, FROM THE EARLY STAGES OF BILLET ANALYSIS TO THE FINAL SCORING OF THE EVALUATIONS REPORTED HERE. J. H. PRICE, MNC, U.S.N. TOOK PART IN ALL PHASES, WITH A CONTINUALLY ACCELERATING DEGREE OF INTEREST AND ENTHUSIASM. SUCH INACCURACIES AS MAY OCCUR IN THE FINAL FORM OF THE CRITERION WHICH FORMS THE BASIS OF THIS RESEARCH CANNOT BE LAID TO HIM. WHATEVER EXCELLENCE WAS ATTAINED WAS LARGELY THROUGH HIS EFFORTS. APPRECIATION IS ALSO EXPRESSED TO THE PETTY OFFICERS WHO ACTED AS EXAMINERS UNDER THE DIRECTION OF CHIEF PRICE:

BRINKLEY, CHARLES B., MNC

LUCAS, KENNETH W., GMC

MC QUEARY, ELMER L., TMC

WRIGHT, FRANK A., TMC

TURBETT, CLYDE G., AOI

THESE MEN IN THEIR DILIGENCE AND LOYALTY TO THE PROJECT CONTRIBUTED NO SMALL AMOUNT TO ITS SUCCESSFUL COMPLETION. SPECIAL MENTION SHOULD BE MADE OF CALAM M. LACOMBE, EMC, UPON WHOM FELL THE BURDEN OF SCHEDULING

CONFIDENTIAL

CONFIDENTIAL

THE MINEMEN SUBJECTS.

WE RECEIVED ASSISTANCE ON SEVERAL PHASES OF THIS PROJECT FROM CAPT. JOHN H. LONG, COMMANDING OFFICER, U.S. NAVAL SCHOOLS, MINE WARFARE. WE WOULD LIKE TO EXPRESS OUR APPRECIATION FOR THE COOPERATION AND HELP GIVEN BY CAPT. LONG AND THE FOLLOWING MEMBERS OF HIS STAFF:

CDR. ROBERT A. SCURLOCK, EXECUTIVE OFFICER

LCDR. DALE V. SCHERMERHORN, SCHOOLS OFFICER

LT. RALPH E. SWISHER, OFFICER IN CHARGE, MINES

LTJG. WALTER E. BUCH, ASSISTANT OFFICER IN CHARGE, MINES

GRATEFUL ACKNOWLEDGEMENT IS MADE TO CAPT. E. K. WALKER, COMMANDING OFFICER, U.S. NAVAL MINE DEPOT, YORKTOWN, VIRGINIA. HE AND THE FOLLOWING MEMBERS OF HIS STAFF SUPPORTED GRACIOUSLY AND SPEEDILY ALL REQUESTS MADE BY THE RESEARCH PERSONNEL. THE MEMBERS OF HIS STAFF WHO DESERVE ESPECIAL CREDIT ARE:

CDR. B. H. SHUPPER, EXECUTIVE OFFICER

CDR. W. E. BENBOW, ORDNANCE OFFICER

CDR. F. C. HUMPHREYS, PLANNING OFFICER

LT. D. W. VANCE, PERSONNEL OFFICER

IN ADDITION, THE FOLLOWING OFFICERS, WHO WENT TO A GREAT DEAL OF TROUBLE IN MAKING MEN AVAILABLE FOR EVALUATION SHOULD BE MENTIONED:

LT. J. J. BUTT, OFFICER IN CHARGE, PROJECT 4

LTJG. F. C. MATTERN, JR., ASSISTANT MINES SERVICE TEST OFFICER

CONFIDENTIAL

CONFIDENTIAL

ENS. F. M. HOLLEN, MINE MECHANISM OFFICER

CHGUN. R. K. SCHARDIN, ASSISTANT INSPECTION OFFICER

INFORMATION WHICH WAS OF GREAT HELP IN DEVELOPING THE CRITERION
MEASURE WAS OBTAINED FROM:

MR. L. J. BLUMENTHAL, TEST SET ENGINEER, NOL

MR. M. C. HANSEN (RE7A), BU ORD

MR. E. L. JOHNSTON (MA7), BU ORD

LT. CHARLES H. WILLIS WHO WAS ASSIGNED AS LIAISON OFFICER FOR THIS
PROJECT WAS VERY COOPERATIVE IN ALL PHASES. IN MOST CASES HE ACCOMPANIED
PSYCHOLOGICAL RESEARCH ASSOCIATES REPRESENTATIVES TO THE NAVY INSTALLATIONS
WHICH WERE VISITED.

CLERICAL ASSISTANCE WAS PROVIDED BY MRS. LA VERNE BLOCK, MISS CORA
LEE HALL, AND MISS I.A. KELLY. MR. H. E. PRICE SPENT MUCH TIME AND EFFORT
ON ILLUSTRATIONS AND GRAPHS.

LAST BUT NOT LEAST WE WISH TO EXPRESS OUR APPRECIATION TO THE MINE-
MEN WHO PARTICIPATED AS SUBJECTS IN THIS PROJECT. THEY REMAIN ANONYMOUS
AS PROMISED.

ALL PHOTOGRAPHS WHICH APPEAR IN THIS REPORT ARE OFFICIAL NAVY PHOTO-
GRAPHS.

CONFIDENTIAL

CONFIDENTIAL

A BRIEF SUMMARY OF THIS REPORT

THIS REPORT DESCRIBES THE DEVELOPMENT OF A BILLET CRITERION MEASURE, AND ITS ADMINISTRATION TO 111 MINEMEN.

THE MEASURE WAS DEVELOPED FROM BILLET DESCRIPTIONS GATHERED IN PREVIOUS RESEARCH WITH THE HELP OF SUBJECT MATTER EXPERTS. IN ITS FINAL FORM IT CONTAINED NINE STATIONS, EACH OF WHICH PROVIDED AN EVALUATION OF HOW WELL A MINEMAN COULD PERFORM ON AND HOW MUCH HE KNEW ABOUT CERTAIN MINE COMPONENTS. A QUICK OVERVIEW OF THE STATIONS IS PROVIDED IN CHAPTER VI.

THE SCORES AS ANALYSED AFTER ADMINISTRATION SHOWED DIFFERENCES BETWEEN PAY GRADES IN THE DIRECTION WHICH WAS EXPECTED. THE DIFFERENTIAL IS SHOWN GRAPHICALLY IN FIGURE 10, PAGE 66.

IT IS FELT THAT THE MEASURE TO WHICH SUGGESTIONS FOR FUTURE USE ARE APPENDED, CAN BE USED BY THE NAVY AS A STANDARD AGAINST WHICH TO EVALUATE SUCH THINGS AS CLASS-ROOM PROCEDURES, AND PENCIL AND PAPER TESTS OF JOB PROFICIENCY. THE USE OF THE CRITERION AS A MEASURE TO DETERMINE TRAINING DEFICIENCIES IS ALSO POSSIBLE. PERSONNEL MANAGEMENT PROCEDURES WITHIN AN OPERATIONAL UNIT MAY BE IMPROVED THROUGH EVALUATION OF TRAINED MEN ALREADY ON THE JOB.

IN ADDITION, THIS REPORT CAN SERVE AS A "HANDBOOK" FOR THE NAVY'S USE IN CONSTRUCTING PERFORMANCE CRITERION MEASURES FOR OTHER BILLETS.

CONFIDENTIAL

CONFIDENTIAL

CHAPTER I

INTRODUCTION

THIS REPORT IS PART V OF FIVE PERSONNEL STUDIES IN THE FIELD OF MINE WARFARE, PRODUCED BY PSYCHOLOGICAL RESEARCH ASSOCIATES UNDER CONTRACT NONR 902 (00). THE REPORTS ARE TITLED AS FOLLOWS:

- (1) TECHNICAL REPORT - PART I - PROCEDURES, MANUALS, AND FORMS FOR INTERVIEWING, TABULATING, AND COMPILING BILLET ANALYSIS INFORMATION (UNCLASSIFIED).

APPENDICES TO TECHNICAL REPORT - PART I - PROCEDURES, MANUALS, AND FORMS FOR INTERVIEWING, TABULATING, AND COMPILING BILLET ANALYSIS INFORMATION (UNCLASSIFIED).

- (2) TECHNICAL REPORT - PART II - MINE WARFARE BILLET DESCRIPTIONS AND SPECIFICATIONS - VOLUME I - MINE COUNTERMEASURES (CONFIDENTIAL)

TECHNICAL REPORT - PART II - MINE WARFARE BILLET DESCRIPTIONS AND SPECIFICATIONS - VOLUME II - MINING (CONFIDENTIAL).

- (3) TECHNICAL REPORT - PART III - (SECRET).

- (4) TECHNICAL REPORT - PART IV - RECOMMENDATIONS FOR SELECTION STANDARDS AND TRAINING FOR MINE WARFARE BILLETS (CONFIDENTIAL).

- (5) TECHNICAL REPORT - PART V - CRITERION DEVELOPMENT FOR THE MINEMAN BILLET (CONFIDENTIAL).

THE PRESENT REPORT IS THE FINAL STUDY IN PERSONNEL STUDIES IN MINE WARFARE, AND EMPLOYS DATA PREVIOUSLY REPORTED IN FORMER STUDIES, PARTICULARLY FROM PART II. IN ORDER TO UNDERSTAND ADEQUATELY THE COLLECTION AND USE OF BILLET ANALYSIS INFORMATION IN THE CONSTRUCTION OF PERFORMANCE

CONFIDENTIAL

CONFIDENTIAL

MEASURES, THE READER IS ADVISED TO REFER TO THE REPORTS LISTED ABOVE.

INITIALLY IT WAS PLANNED TO STUDY PRESENT METHODS FOR ASSESSING PROFICIENCY IN THE MORE CRITICAL MINE WARFARE BILLETS. FOR THOSE BILLETS JUDGED TO BE OF CRITICAL IMPORTANCE AND FOR WHICH ADEQUATE PERFORMANCE STANDARDS WERE NOT AVAILABLE, EFFORTS WOULD BE MADE TO DEVELOP SUCH MEASURES AND SUBJECT THEM TO EVALUATION. IT WAS DECIDED THAT EMPHASIS SHOULD BE ON ON-THE-JOB PERFORMANCE RATHER THAN ON PAPER AND PENCIL TESTS OF THEORETICAL KNOWLEDGE WHEREVER POSSIBLE. IT WAS FELT THAT ONLY THROUGH BILLET BEHAVIOR MEASURES WOULD OPERATIONAL PROFICIENCY BE ADEQUATELY PREDICTED.

AS THE PROJECT PROGRESSED IT BECAME EVIDENT THAT SOME DELIMITING WOULD BE NECESSARY, CONSEQUENTLY THE CRITERION DEVELOPMENT DESCRIBED IN THIS REPORT DEALS WITH A SINGLE CRITICAL BILLET, MINEMAN. THE DECISION TO DELIMIT, MADE IN CONFERENCE WITH THE PERSONNEL ANALYSIS DIVISION OF THE BUREAU OF NAVAL PERSONNEL, WAS PROMPTED BY THE DIVERSITY OF BILLET ACTIVITIES IN MINE WARFARE. IT WAS DECIDED THAT WHAT WAS NECESSARY WAS A METHODOLOGY OR PROCEDURE FOR NAVY PERSONNEL TO FOLLOW IN CONSTRUCTING SPECIFIC PERFORMANCE TESTS FOR USE AS CRITERIA.

THE EMPHASIS THROUGHOUT THIS PART OF THE PROJECT WAS TO DEVELOP A CRITERION IN SUCH A WAY THAT THE METHOD COULD SERVE AS A GUIDE FOR CRITERION CONSTRUCTION, BY NAVY PERSONNEL, FOR OTHER BILLETS. A SUBJECT-MATTER EXPERT CAN USE THIS REPORT IN CONSTRUCTING CRITERION MEASURES WITH A

CONFIDENTIAL

CONFIDENTIAL

MINIMUM OF HELP FROM PSYCHOLOGISTS OR PERSONNEL TECHNICIANS. SUCH HELP
MAY BE DESIRABLE ESPECIALLY IN THE FINAL STAGES OF STATISTICAL EVALUATION
AND ANALYSIS OF DATA.

CONFIDENTIAL

CONFIDENTIAL

CHAPTER II

THE NEED FOR AND CHARACTERISTICS OF A CRITERION

THE NEED FOR A CRITERION

IN ORDER TO EVALUATE THE ADEQUACY OF EXAMINATIONS AND TESTS GIVEN IN SITUATIONS WHICH REQUIRE AN ESTIMATE OF JOB ABILITY IT IS NECESSARY TO HAVE A STANDARD FOR COMPARISON. THE INSTRUCTOR WHO CONSTRUCTS AN EXAMINATION FOR HIS COURSE MAY HIMSELF FEEL STRONGLY ABOUT ITS GOODNESS, HE MAY BE SATISFIED THAT THE BEST SCORES GO TO THE BEST STUDENTS AND THAT STUDENTS WHOM HE HAS JUDGED POOR ALSO GET POOR SCORES ON HIS EXAMINATION. HIS STANDARD OF COMPARISON IS, OF COURSE, HIS PERSONAL JUDGEMENT CONCERNING THE STUDENTS. THIS STANDARD OR CRITERION MAY, RIGHTLY OR WRONGLY, BE QUESTIONED BY THOSE WHO DO NOT HAVE THE SAME HIGH OPINION OF THE INSTRUCTOR'S JUDGEMENT IN THIS MATTER. WHAT IS NECESSARY IS A CRITERION WITH WHICH THE RESULTS OF HIS EXAMINATION CAN BE COMPARED AND WHICH IS INDEPENDENT OF WHATEVER PERSONAL BIAS MAY BE INVOLVED.

THE MAJOR PURPOSE OF THIS REPORT IS TO DELINEATE THE CONSTRUCTION OF A CRITERION WHICH MAY BE USED IN EVALUATING THE JOB PERFORMANCE OF MINEMEN AND WHICH CAN ALSO BE USED TO EVALUATE PAPER AND PENCIL OR OTHER MEASURES OF INFORMATION AND ABILITY.

THE CHARACTERISTICS OF A CRITERION

SCANNING THIS OR ANY REPORT OF CRITERION DEVELOPMENT WILL SUGGEST THAT GREATER EFFORT IS EXPENDED IN DEVELOPING CRITERIA THAN IS USUAL IN

CONFIDENTIAL

CONFIDENTIAL

CONSTRUCTING EXAMINATIONS FOR DAY TO DAY USE. HOWEVER, THE CHARACTERISTICS WHICH ARE DESIRABLE IN EXAMINATIONS ARE THOSE THAT ARE NECESSARY IN CRITERIA. FOLLOWING IS A BRIEF DISCUSSION OF TEST CHARACTERISTICS IMPORTANT IN BOTH.

VALIDITY - IN ORDER THAT A MEASURE BE USEFUL AS AN EXAMINATION OR AS A CRITERION IT MUST, IN A GIVEN SITUATION, DIFFERENTIATE BETWEEN THOSE WHO ARE ABLE AND THOSE WHO ARE NOT. THIS REQUIREMENT IS KNOWN AS VALIDITY. RELATIVE TO THE CONSTRUCTION OF A CRITERION SUCH AS THE PRESENT ONE, THERE ARE THREE ASPECTS OF VALIDITY WHICH MUST BE CONSIDERED. THESE ARE CONTENT VALIDITY, CONCURRENT VALIDITY, AND PREDICTIVE VALIDITY.

1. CONTENT VALIDITY IS SHOWN BY DEMONSTRATING THAT THE CONTENT OF THE MEASURE SAMPLES ADEQUATELY THE SITUATIONS OR SUBJECT MATTER OF THE BILLET. CONTENT VALIDITY IS ESPECIALLY IMPORTANT IN THE CASE OF PROFICIENCY MEASURES.

2. CONCURRENT VALIDITY IS EVALUATED BY SHOWING HOW WELL SCORES ON THE TEST OR CRITERION MEASURE CORRESPOND TO OTHER MEASURES OF CONCURRENT STATUS OR ABILITY.

3. PREDICTIVE VALIDITY IS QUITE SIMILAR TO CONCURRENT VALIDITY EXCEPT FOR THE TIME ELEMENT. PREDICTIVE VALIDITY IS SHOWN BY HOW WELL PREDICTIONS MADE FROM THE MEASURE ARE CONFIRMED BY EVIDENCE GATHERED AT SOME SUBSEQUENT TIME. THIS REQUIRES A RELATIVELY LONG RANGE RESEARCH PROGRAM.

CONFIDENTIAL

CONFIDENTIAL

RELIABILITY - ALTHOUGH VALIDITY IS THE PRIME CONSIDERATION, A GOOD MEASURE MUST ALSO BE RELIABLE. IT MUST MEASURE THE ABILITY IN A CONSTANT AND CONSISTENT WAY. IF AN INDIVIDUAL DOES WELL ONE DAY, HE SHOULD NOT FAIL ON THE SAME THING THE NEXT, ASSUMING THAT HE HAS NOT CHANGED SIGNIFICANTLY IN ABILITY. FURTHER, SUCCESSIVE EXAMINERS WHO SCORE AN INDIVIDUAL SHOULD OBTAIN VERY SIMILAR RESULTS. THIS LAST POINT IS INTIMATELY LINKED WITH THE CHARACTERISTIC OF MEASURES DESCRIBED NEXT.

OBJECTIVITY - ONE FEATURE WHICH TENDS TO INCREASE THE RELIABILITY OF SCORES IS OBJECTIVITY. THIS CHARACTERISTIC REQUIRES THAT A MINIMUM OF PERSONAL BIAS BE PRESENT IN SCORING. LACK OF OBJECTIVITY RESULTS IN AN INDIVIDUAL'S SCORE FLUCTUATING ACCORDING TO THE DAY TO DAY CHANGES IN THE FEELINGS OF THE EXAMINER. THE SCORE RECEIVED WILL VARY DEPENDING UPON WHICH EXAMINER SCORES THE PERFORMANCE.

FACE VALIDITY - ANOTHER DESIRABLE CHARACTERISTIC WHICH IS OFTEN CONSIDERED ESSENTIAL IS FACE VALIDITY. THIS REQUIRES THAT THE MEASURE NOT ONLY BE VALID BUT THAT IT HAVE THE APPEARANCE OF VALIDITY. IF THE INDIVIDUAL TO BE EXAMINED IS TO DO HIS BEST ON THE EXAMINATION IT IS PARTICULARLY IMPORTANT THAT HE CONSIDER THE MEASURE RELATED TO THE JOB DUTIES AND RESPONSIBILITIES CALLED FOR BY THE BILLET IN WHICH HE IS BEING EVALUATED.

PRACTICALITY - CLOSELY RELATED TO THE ABOVE EARMARKS OF A GOOD MEASURE IS THE REQUIREMENT THAT IT BE PRACTICAL TO ADMINISTER AND SCORE.

CONFIDENTIAL

CONFIDENTIAL

A MEASURE WHICH IS GOOD IN OTHER RESPECTS MAY FAIL IN USEFULNESS THROUGH BEING TOO TIME CONSUMING OR DIFFICULT TO EMPLOY.

MENTION OF THESE CHARACTERISTICS, AS THEY APPLY TO THE MEASURE DEVELOPED IN THIS RESEARCH IS MADE IN APPENDIX C.

CONFIDENTIAL

CONFIDENTIAL

CHAPTER III

PLANNING THE CRITERION MEASURE

PRELIMINARY PLANNING OF CRITERION

PREVIOUS WORK ON CONTRACT NONR 902 (00) YIELDED A COMPLETE BILLET DESCRIPTION OF THE MINEMAN'S JOB. THE ACTIVITIES WHICH COMPOSE THIS BILLET ARE PRESENTED IN TECHNICAL REPORT - PART II - MINE WARFARE BILLET DESCRIPTIONS AND SPECIFICATIONS (CONFIDENTIAL). THEY INVOLVE 1041 TASKS, EACH DESCRIBED IN THE REPORT UNDER A FLAG STATEMENT. THE TASKS COVER THE LARGE NUMBER OF DIFFERENT KINDS OF ACTIVITIES WHICH A MINEMAN PERFORMS. AMONG OTHER THINGS, THE TASKS VARY IN HOW ROUTINE THEY ARE, IN IMPORTANCE, IN DIFFICULTY, AND IN THE NUMBER OF MEN REQUIRED TO DO THEM. FURTHER, IT WAS IMMEDIATELY APPARENT THAT NOT ALL OF THEM COULD BE PRACTICALLY TESTED. WHAT FOLLOWS IS A DESCRIPTION OF THE MANNER IN WHICH THE 1041 TASKS WERE REDUCED TO A MANAGEABLE NUMBER.

A) PARTICIPATION OF SUBJECT MATTER SPECIALISTS AND PSYCHOLOGICAL RESEARCH ASSOCIATES.

EACH OF THE 1041 FLAG STATEMENTS WAS TYPED ON A 3 BY 5 CARD AND ALL WERE ASSEMBLED IN A BOX IN THE ORDER IN WHICH THEY APPEARED IN TECHNICAL REPORT - PART II - MINE WARFARE BILLET DESCRIPTIONS AND SPECIFICATIONS (CONFIDENTIAL) - VOLUME II - MINING. SIX SUCH SETS WERE TYPED. SIX MINEMEN EXPERTS (FOUR CHIEF PETTY OFFICERS AND TWO FIRST CLASS PETTY OFFICERS) WERE EACH PRESENTED WITH A SET OF CARDS AND INSTRUCTIONS TO SORT THEM INDEPENDENTLY THROUGH FIVE SUCCESSIVE BARRIERS:

CONFIDENTIAL

CONFIDENTIAL

FIRST SORT: REPRESENTATIVENESS. IS THIS TASK REPRESENTATIVE OF THE WORK
(ALL CARDS) THE MINEMAN DOES IN GENERAL, THAT IS, IS THIS TASK ISOLATED, UNUSUAL, AND ONLY DONE IN ONE OR TWO MINES OR, IS IT ROUTINE AND DONE ON MOST MINES? IF THE TASK IS ISOLATED OR UNUSUAL, THAT IS, NOT TYPICAL OF WHAT THE MINEMAN DOES IN HIS DAY-TO-DAY WORK, PUT THE CARD IN PILE A. IF THE TASK IS ROUTINE AND TYPICAL OF WHAT THE MINEMAN DOES IN HIS DAY-TO-DAY WORK, PUT THE CARD IN PILE B.

SECOND SORT: IMPORTANCE. IS THIS TASK FREQUENTLY REQUIRED OF NEARLY ALL
(PILE B ABOVE) MINEMEN? (AT FIRST, FREQUENTLY WAS DEFINED AS AN AVERAGE OF ONCE A MONTH BUT IT SOON BECAME EVIDENT THAT THIS WOULD RESULT IN PRACTICALLY ALL CARDS BEING DELETED. CONSEQUENTLY, FREQUENTLY WAS REDEFINED AS ONCE A YEAR). IF THE TASK IS NOT FREQUENTLY REQUIRED OF THE MINEMAN, PUT THE CARD IN PILE A. IF THE TASK IS FREQUENTLY REQUIRED OF THE MINEMAN, PUT THE CARD IN PILE B.

THIRD SORT: DIFFICULTY. IS THIS TASK SO EASY THAT ALL MINEMEN CAN DO
(PILE B ABOVE) IT WITHOUT ANY TROUBLE OR SO HARD THAT VERY FEW MINEMEN CAN DO IT? IF THE TASK IS EITHER SO EASY THAT ALL MINEMEN CAN DO IT WITHOUT ANY TROUBLE OR SO HARD THAT VERY FEW MINEMEN CAN DO IT, PUT THE CARD IN PILE A. PUT ALL OTHER TASK CARDS, THAT IS, THOSE THAT ARE MEDIUM HARD IN PILE B.

CONFIDENTIAL

CONFIDENTIAL

FOURTH SORT: ONE MAN TASK. CAN THIS TASK BE COMPLETED ENTIRELY BY ONE
(PILE B
ABOVE)

MAN WITHOUT HELP, EVEN THOUGH IT MIGHT TAKE HIM MORE TIME?
IF THE TASK REQUIRES MORE THAN ONE MAN TO DO IT, PUT THE
CARD IN PILE A. IF THE TASK REQUIRES ONLY ONE MAN TO DO
IT, PUT THE CARD IN PILE B.

FIFTH SORT: PRACTICALITY. CAN THIS TASK BE TESTED BY A PRACTICAL TEST,
(PILE B
ABOVE)

THAT IS, CAN A TEST BE DEvised TO TEST THIS TASK WHICH WOULD
NOT REQUIRE ANY "DEAD TIME", (SUCH AS A RUN DOWN TEST FOR
A 24 HOUR CLOCK) OR THE TASK WOULD NOT REQUIRE EXPENSIVE
"MOCK-UPS"? IF THE TASK CANNOT BE TESTED BY A PRACTICAL
TEST PUT THE CARD IN PILE A. IF THE TASK CAN BE PRACTICALLY
TESTED PUT THE CARD IN PILE B.

PILE B OF THE FIFTH SORT FROM EACH OF THE SIX SORTERS WAS THEN
USED TO SELECT THE TASKS WHICH HAD PASSED THESE BARRIERS SUCCESSIVELY.
THE STANDARD OF ACCEPTABILITY WAS SET AT FOUR OF THE SIX. THUS, ANY
CARD WHICH APPEARED IN FOUR OF THE SIX FINAL PILES WAS ACCEPTED FOR POSS-
IBLE INCLUSION IN THE CRITERION MEASURE. TWENTY-EIGHT CARDS, EACH REPRESENTING A MN TASK, WERE PASSED THROUGH ALL FIVE BARRIERS BY FOUR OF
THE SIX SORTERS.

B) THE QUESTIONNAIRE

WHILE THIS SORTING PROCEDURE IS AN EXCELLENT MEANS OF REDUCING THE
TASKS TO A MANAGEABLE NUMBER, FURTHER CONSIDERATION WAS NECESSARY IN THE
SCREENING PROCESS. IN THIS KIND OF SELECTION PROCESS A TASK MIGHT BE

CONFIDENTIAL

CONFIDENTIAL

REJECTED DURING THE "FREQUENCY" SORT THAT PERHAPS IS SO CRITICAL AS TO DEMAND EVALUATION OF A MINEMAN'S ABILITY TO PERFORM IT. THUS, A REVIEW OF THE REJECTED "A" PILES WAS NECESSARY AND IN THE PRESENT INSTANCE WAS CARRIED OUT. NO EXCEPTION TO THE SORTING PROCESS WAS DEEMED NECESSARY. IN THIS CONNECTION IT IS INTERESTING TO NOTE THAT THE "DIFFICULTY" SORT RESULTED IN THE REJECTION OF TASKS WHICH IN THE OVERWELMING MAJORITY WERE "EASY" RATHER THAN "HARD".

FURTHER PARTICIPATION OF THE MINEMEN EXPERTS INVOLVED FILLING OUT A QUESTIONNAIRE CONSTRUCTED TO OBTAIN FURTHER INFORMATION ABOUT THE 28 TASKS ON WHICH FOUR OF THE SIX SORTERS AGREED. THE ADMINISTRATION OF THE QUESTIONNAIRE PROVIDED DETAILS WHICH WERE OF GREAT VALUE IN ITEM CONSTRUCTION IN A LATER STEP. THE GENERAL FORMAT OF THE QUESTIONNAIRE IS PRESENTED BELOW:

1. I HAVE SEEN THIS JOB DONE ABOUT _____ TIMES.
2. THE THING THAT MANY MEN FORGET TO DO WHEN DOING THIS JOB IS:

3. THIS WAS FORGOTTEN ABOUT _____ TIMES OUT OF THE NUMBER I HAVE SEEN.
4. IF THIS WERE DISCOVERED RIGHT AWAY IT WOULD TAKE ABOUT _____

CONFIDENTIAL

CONFIDENTIAL

MINUTES TO FIX AND ^{WOULD}
WOULD NOT REQUIRE REPLACEMENT. IF NOT DIS-
COVERED RIGHT AWAY IT WOULD:

5. THE MOST COMMON MISTAKE MADE IN DOING THIS JOB IS:

6. THIS MISTAKE WAS MADE ABOUT _____ TIMES OUT OF THE NUMBER I
HAVE SEEN.

7. IF THIS WERE DISCOVERED RIGHT AWAY IT ^{WOULD}
WOULD NOT REQUIRE REPLACE-
MENT. IF NOT DISCOVERED RIGHT AWAY IT WOULD:

8. IF YOU GAVE A MAN THIS JOB TO DO YOU COULD TELL THAT HE WAS A
BETTER THAN AVERAGE MINEMAN IF HE:

CONFIDENTIAL

CONFIDENTIAL

9. IF ALL APPARATUS IS IN GOOD CONDITION:

- A. A GOOD EXPERIENCED MINEMAN SHOULD BE ABLE TO DO THIS JOB IN _____ MINUTES.
- B. AN AVERAGE MINEMAN WOULD TAKE ABOUT _____ MINUTES.
- C. A POOR OR INEXPERIENCED MINEMAN MIGHT TAKE _____ MINUTES.

10. COMMENT ON BACK OF THIS SHEET.

THE INFORMATION PRESENTED ABOVE IN THE QUESTIONNAIRE FORMAT WAS OBTAINED FROM THE MINEMEN EXPERTS ON EACH OF THE FOLLOWING TASKS.

- 1. PREPARES FOR TEST ON B-21 (BA 241/U) BATTERY.
- 2. MAKES LOAD TEST ON B-21 (BA 241/U) BATTERY.
- 3. PREPARES FOR ELECTRICAL SENSITIVITY TEST ON A-5 FIRING MECHANISM.
- 4. MAKES ELECTRICAL SENSITIVITY TEST ON A-5 FIRING MECHANISM.
- 5. SETS UP MICROPHONE FOR ACOUSTIC TEST ON A-5 FIRING MECHANISM.
- 6. MAKES ACOUSTIC SENSITIVITY TEST ON A-5 FIRING MECHANISM.
- 7. SETS UP MK 65 TEST SET.
- 8. MAKES ELECTRICAL TEST ON A-6 (OR A-8) FIRING MECHANISM.
- 9. MAKES FINAL CHECK AND CONTINUITY TEST ON M-3 FIRING MECHANISM.
- 10. MAKES FINAL INSPECTION OF M-5 FIRING MECHANISM.
- 11. MAKES INSULATION TEST ON M9-0 FIRING MECHANISM.
- 12. RESETS SENSITROL AND STEPS TO HOME POSITION, M9-0 FIRING MECHANISM.
- 13. MAKES OPERATE TEST ON M9-0 FIRING MECHANISM.
- 14. MAKES NON-OPERATE TEST ON M9-0 FIRING MECHANISM.

CONFIDENTIAL

CONFIDENTIAL

15. MAKES INITIAL AND SUBSEQUENT RESET TIME TESTS, M9-0 FIRING MECHANISM.
16. CHECKS OVER-ALL CYCLE TIMES, M9-0 FIRING MECHANISM.
17. MAKES FIRING TEST, M9-0 FIRING MECHANISM.
18. MAKES INSULATION TEST, M9-1 FIRING MECHANISM.
19. CYCLES SS-8 AND RESETS SS-9, M9-1 FIRING MECHANISM.
20. MAKES TIMING TEST, M9-1 FIRING MECHANISM.
21. MAKES SENSITIVITY AND BALANCE TESTS ON M-11 FIRING MECHANISM.
22. MAKES OHMMETER TEST ON CD-4.
23. TESTS FOR SWITCH CONTACT, CD-14.
24. RESETS CLOCK TO 0 INDEX POINT, CD-14.
25. HOOKS UP Mk 41 TEST SET.
26. HOOKS UP Mk 27 TEST SET.
27. CHECKS RUNNING TIME OF A-8 FIRING MECHANISM.
28. TAKES EXCITER COIL READING MINE Mk 36-1.

PLANNING CRITERION FORM AND CONTENT

A) DEVELOPMENT OF CRITERION FORM

A NUMBER OF THINGS WERE CONSIDERED IN DEVELOPING THE FORM OF THE CRITERION MEASURE. THESE INCLUDED THE RANGE AND TYPE OF CONTENT, THE TIME REQUIRED FOR ADMINISTRATION, THE NUMBER AND SKILL LEVEL OF THE MINE-MEN TO BE TESTED, THE NUMBER AND KIND OF ADMINISTRATIVE PERSONNEL, THE

CONFIDENTIAL

CONFIDENTIAL

PHYSICAL LOCATION OF TESTING, AND APPARATUS PROBLEMS.

THE CONTENT CONSIDERATIONS ARE DEVELOPED IN SECTION 'B) FOLLOWING. SOME BRIEF COMMENTS AND JUDGEMENTS ABOUT THE REST OF THE CONSIDERATIONS ARE INCLUDED HERE. THE CHARACTERISTICS OF THE FINAL FORM OF THE CRITERION ARE LISTED BELOW WITH ACCOMPANYING RATIONALES.

(1) LENGTH. IT WAS DECIDED THAT THE PERFORMANCE MEASURE SHOULD NOT EXCEED THREE HOURS FOR A TYPICAL MINEMAN AND SHOULD NOT EXCEED FOUR HOURS FOR THE SLOWER PERFORMERS. IN PART THIS WAS BASED ON CONSIDERATIONS OF FATIGUE AND IN PART ON ADMINISTRATIVE PROBLEMS. IT SHOULD BE NOTICED THAT THIS TIME IS MORE THAN THE AMOUNT WHICH WOULD BE REQUIRED TO GET AN APPRAISAL OF A MINEMAN'S PERFORMANCE IN FUTURE ADMINISTRATIONS OF THE CRITERION MEASURE. THE DEVELOPMENT OF THE CRITERION REQUIRES THE INCLUSION OF MORE ITEMS THAN DOES ROUTINE TESTING, FOR EXAMPLE, ALLOWANCE IS MADE FOR ITEMS WHICH IN THE RESEARCH VERSION DO NOT PROVE ADEQUATE.

(2) DIFFICULTY. THE VARIATION IN SKILL LEVEL OF MINEMEN DEMANDS A MEASURE IN WHICH THE DIFFICULTY RANGES FROM EASY TO VERY COMPLEX ITEMS. A SPECIAL PROBLEM OF THIS RESEARCH WAS TO DEVELOP A MEASURE WHICH WOULD ALLOW COMPARISONS TO BE MADE AMONG MINEMEN OF ALL PAY GRADES. THE FINAL FORM HAD TO INCLUDE MATERIAL WHICH WOULD GIVE A CHIEF PETTY OFFICER A CHANCE TO DEMONSTRATE HIS ABILITY AND AT THE SAME TIME ALLOW A SEAMAN APPRENTICE TO MAKE A SCORE THAT REFLECTS HIS SKILL.

(3) APPARATUS. THE DECISION TO BUILD THE CRITERION AROUND ACTUAL

CONFIDENTIAL

CONFIDENTIAL

MINE COMPONENTS RATHER THAN A COMPOSITE TESTING APPARATUS WAS LARGELY BASED ON THE CONDITION OF PRACTICALITY. IT WAS DECIDED THAT IT WOULD BE BETTER TO USE COMPONENTS AVAILABLE AT MINE WARFARE BASES. THE TRAINING OF TEST ADMINISTRATORS WAS THEREBY MADE SIMPLER SINCE THEY REQUIRED NO EXTENSIVE INTRODUCTION TO THE GEAR EMPLOYED. ALSO, THE MEN TESTED WERE UNDOUBTEDLY MORE AT EASE WITH RELATIVELY FAMILIAR APPARATUS. THE SELECTION OF THE SPECIFIC COMPONENTS EMPLOYED WAS DETERMINED TO SOME EXTENT BY HOW STURDY IT WAS. APPARATUS WHICH IS USED TO TEST OVER 100 MEN, MANY OF WHOM ARE RELATIVELY INEXPERIENCED, NEEDS OF NECESSITY TO BE RUGGED.

(4) TIMING. AN EARLY DECISION IN DEVELOPMENT REFLECTED CONSIDERABLE THOUGHT GIVEN TO THE TIME LIMIT VERSUS NO TIME LIMIT PROBLEM. EXAMINATION OF THE MINEMAN'S JOB SHOWS THAT WHILE HE FREQUENTLY IS CALLED UPON TO TURN OUT A LARGE VOLUME OF WORK THE CONDITIONS UNDER WHICH HE DOES SO ARE LIMITED MOST OF THE TIME BY THE CARE NECESSARY IN PREPARING AND TESTING MINE COMPONENTS. IN THE JUDGEMENT OF THE SUBJECT MATTER EXPERTS, ONE OF THE CRITICAL BEHAVIORS OF SUCCESSFUL MINEMEN WAS THAT THEY "TAKE THEIR TIME". AS A RESULT THE EXAMINATION WAS CONSTRUCTED AS A NON-TIMED TEST AND NO ITEM WAS SCORED ON THE BASIS OF HOW LONG A MINEMAN TOOK TO COMPLETE IT. ONE ITEM, THE LAST OF STATION 2, INVOLVED A TIME LIMIT FOR ADMINISTRATIVE REASONS. EXPERIENCE IN A TRYOUT SUGGESTED THAT MEN WHO EVENTUALLY COMPLETED THIS ITEM DID SO IN A SHORTER TIME THAN THE FIVE MINUTES FINALLY

CONFIDENTIAL

CONFIDENTIAL

ALLOTTED.

(5) STRUCTURE. THE BREAKDOWN OF THE WHOLE TESTING SEQUENCE INTO NINE STATIONS DEVELOPED OUT OF ALL THE CONSIDERATIONS LISTED IN THE FIRST PARAGRAPH OF THIS SECTION. ONE OF THE MORE EVIDENT VALUES OF THIS SYSTEM IS THAT IT ALLOWS FOR THE TESTING OF MORE THAN ONE MAN AT A TIME. THE NUMBER OF MINEMEN WHO CAN BE TESTED AT ONCE IS LIMITED BY TWO FACTORS:

A. THE NUMBER OF TRAINED ADMINISTRATORS AVAILABLE

B. THE NUMBER OF AVAILABLE SEPARATE COPIES OF THE COMPONENTS USED IN TESTING. A MINOR CONSIDERATION HERE IS THE FACT THAT A STATION WHICH IS "HIGH LEVEL" OR DIFFICULT SHOULD NOT BE ADMINISTERED AS THE FIRST TEST. IN TRYOUTS OF THE STATIONS TO BE DESCRIBED LATER, THE POLICY IN THIS RESEARCH WAS TO START A MINEMAN OUT ON ONE OF THE EASIER STATIONS.

B) SELECTION OF CRITERION CONTENT

THIS SECTION IS INTENDED TO DESCRIBE THE STEPS OF ADDITION AND SUBTRACTION INVOLVED IN ARRIVING AT THE GENERAL CONTENT OF THE CRITERION MEASURE. THE DEVELOPMENT OF SPECIFIC ITEMS OF CONTENT WILL BE DISCUSSED FURTHER ON. THE BASIS FOR GENERAL CONTENT SELECTION WAS OF COURSE THE 28 TASKS SELECTED AS DESCRIBED EARLIER. SEPARATE BUT INTERRELATED ANALYSES WERE PERFORMED IN CONNECTION WITH THESE DATA RESULTING FROM THE COOPERATION OF SUBJECT MATTER EXPERTS AND PSYCHOLOGICAL RESEARCH ASSOCIATES' PROFESSIONAL STAFF.

CONFIDENTIAL

CONFIDENTIAL

ONE ANALYSIS CONSISTED OF DETERMINING THE ELEMENTS WHICH MADE UP EACH OF THE 28 TASKS. THIS WAS DONE BY REFERRING TO THE BILLET DESCRIPTION DEVELOPED EARLIER IN THIS RESEARCH AND BY DERIVING FURTHER INFORMATION FROM RELEVANT OP'S. EACH SPECIFIC ITEM OF BEHAVIOR, BROKEN DOWN INTO ITS SMALLEST UNITS, WAS TALLIED FOR EACH OF THE 28 TASKS. IN ADDITION, BEHAVIOR SEQUENCES WHICH OCCURRED MORE THAN ONCE IN THE TASKS WERE NOTED. THIS ANALYSIS ALLOWED THE EXCLUSION OF CERTAIN STEPS IN A SPECIFIC TASK BECAUSE OF SIMPLICITY; OTHER STEPS WERE EXCLUDED BECAUSE THEY WERE ESSENTIALLY REPETITIOUS. HAVING A CLEAR PICTURE OF HOW THE BASIC TASKS WERE ALIKE AND DIFFERENT MADE JUDGEMENTS ABOUT INCLUSION AND EXCLUSION EASIER. ANOTHER ANALYSIS WAS CARRIED OUT ON THE RESPONSES TO THE QUESTIONNAIRE GIVEN TO THE SUBJECT MATTER EXPERTS. THIS YIELDED INFORMATION ABOUT ERRORS OF OMISSION AND ERRORS OF COMMISSION COMMONLY MADE IN DOING THE BASIC TASKS. JUDGEMENTS ABOUT THE TIME REQUIRED TO DO THE TASK ALSO RESULTED FROM THIS ANALYSIS.

IT SHOULD BE EMPHASIZED THAT THESE ANALYSES WERE DONE WITH THE CLOSE COOPERATION OF A SUBJECT MATTER EXPERT (MNC) AND THE CONTRACTOR. FURTHER INFORMATION RELATIVE TO THE SELECTION OF CRITERION CONTENT WAS OBTAINED IN INTERVIEWS WITH REPRESENTATIVES OF THE NAVAL ORDNANCE LABORATORY AND THROUGH INTERVIEWS WITH AND DEMONSTRATIONS BY INSTRUCTORS AT U. S. NAVAL SCHOOLS, MINE WARFARE, YORKTOWN, VIRGINIA.

AN ADVANTAGE OF THE CLOSE AFFILIATION OF THE CONTRACTOR WITH SUBJECT

CONFIDENTIAL

CONFIDENTIAL

MATTER EXPERTS WAS THE REALIZED POSSIBILITY OF MAKING CONTENT SELECTION MORE THAN A MECHANICAL FOLLOWING OF QUANTITATIVE PROCEDURES. AS THE LIST OF "MUST BE INCLUDED" TASKS GREW, IT WAS POSSIBLE TO ADD TO THE MATERIAL DRAWN FROM THE BILLET DESCRIPTIONS. IT SOON BECAME APPARENT, FOR EXAMPLE, THAT SOME OF THE OPERATIONS INVOLVED IN THE MINEMAN'S BILLET WERE IMPLIED RATHER THAN STATED IN THE BILLET DESCRIPTION, OTHERS WERE OF SUCH A NATURE AS TO BE TAKEN FOR GRANTED. IN THIS REGARD AND AT THE SUGGESTION OF SUBJECT MATTER EXPERTS SUCH THINGS AS SOLDERING, USE OF TOOLS, SCHEMATIC DIAGRAM READING, AND THE CLOSING OF MINE CASES WERE INCLUDED IN THE FINAL LIST OF TASKS.

C) GENERAL CONTENT OF THE CRITERION MEASURE

THE STEPS DESCRIBED IN SECTION (B) RESULTED IN JUDGEMENTS TO INCLUDE IN THIS MEASURE THE FOLLOWING KINDS OF TASKS:

- (1) IDENTIFICATION OF COMPONENTS
- (2) ASSEMBLY AND DISASSEMBLY OF COMPONENTS
- (3) ROUTINE TESTING OF COMPONENTS
- (4) TROUBLE SHOOTING
- (5) SELECTION AND USE OF TOOLS
- (6) USE OF REFERENCE MATERIAL

THE ANALYSES OF THE 28 BASIC TASKS DETERMINED THE INCLUSION OF THE FOLLOWING COMPONENTS:

CONFIDENTIAL

CONFIDENTIAL

- (1) AN ACOUSTIC FIRING MECHANISM
- (2) A MAGNETIC PRESSURE FIRING MECHANISM
- (3) A DIP NEEDLE FIRING MECHANISM
- (4) A MAGNETIC - INDUCTION FIRING MECHANISM
- (5) COMPONENTS SUCH AS CLOCK DELAY MECHANISMS AND BATTERIES
ASSOCIATED WITH THE MINES IN WHICH THE FIRING MECHANISMS
ARE EMPLOYED.

THE READER MAY REFER TO CHAPTER VI FOR A BRIEF OVERVIEW OF THE
SPECIFIC CONTENT OF THE CRITERION MEASURE, AND TO APPENDIX B FOR MORE
DETAILED INFORMATION ABOUT EACH OF THE MINE STATIONS FINALLY INCLUDED.

CONFIDENTIAL

CONFIDENTIAL

CHAPTER IV

CONSTRUCTION OF THE CRITERION MEASURE

THE CLOSE COOPERATION BETWEEN THE CONTRACTOR AND SUBJECT MATTER EXPERTS WHICH CHARACTERIZED THE PRELIMINARY PLANNING OF THE CRITERION WAS EVEN MORE INDISPENSIBLE THROUGHOUT THE CONSTRUCTION STAGES. THE GREATER PART OF THE ITEM AND STATION DEVELOPMENT WAS CARRIED OUT AT THE CONTRACTOR'S OFFICE IN WASHINGTON, D. C. PSYCHOLOGICAL RESEARCH ASSOCIATES WAS IMMENSURABLY AIDED IN THE DEVELOPMENT BY THE PRESENCE IN WASHINGTON OF A MNC ON TAD FROM U. S. NAVAL MINE DEPOT, YDRKTOWN, VIRGINIA. HIS COOPERATION THROUGHOUT ALL STAGES OF THIS RESEARCH CONTRIBUTED NO SMALL PART TO THE PROJECT.

A) RECORDING THE RESULTS

IN GENERAL THE RESULTS OF THE PERFORMANCE TESTS MAY BE RECORDED IN THREE WAYS, THROUGH THE USE OF (1) CHECK LISTS, (2) FINAL PRODUCTS, AND (3) RECORDS MADE BY THE EXAMINEE. EXAMINATION OF THE TENTATIVE CONTENT OF THE CRITERION MEASURE AS IT DEVELOPED IN THE EARLY STAGES SUGGESTED THAT IN MOST CASES THE APPROPRIATE SYSTEM TO EMPLOY WOULD BE THE USE OF CHECK LISTS. THERE WERE, HOWEVER, PARTICULARLY IN THE "USE OF TOOLS" AREA SEVERAL OPPORTUNITIES TO USE FINAL PRODUCTS AS AN ADJUNCT TO THE RECORD. THE DECISION, THEREFORE, WAS TO CONSTRUCT A RECORDING FORM COMPOSED LARGELY OF STATEMENTS REFERRING TO THE MINEMAN'S PROCEDURE BUT CONTAINING IN ADDITION STATEMENTS REFERRING TO THE QUALITY OF THE FINAL

CONFIDENTIAL

CONFIDENTIAL

PRODUCT OF THE MINEMAN'S EFFORT. MOST OF THE PROCEDURE ITEMS WERE PLANNED SO THAT THE EXAMINER COULD RECORD OBJECTIVELY WHAT A MINEMAN DID; OTHERS WERE PLANNED TO ALLOW RECORDING WHAT HE SAID.

B) INITIAL PREPARATION OF STATION ITEMS

THE GENERAL CONTENT DERIVED IN THE PRELIMINARY STAGES OF PLANNING WAS TRANSFORMED INTO SCORABLE ITEMS, STATION BY STATION. THE PROCEDURE FIRST INVOLVED THE SELECTION FROM THE PROPOSED CONTENT OF A UNIT TASK ENCOMPASSING TASK ELEMENTS THAT WERE CRITICAL TO MINEMEN'S PERFORMANCE. EXAMPLES OF THESE TASKS ARE THE CONTENT OF THE STATIONS FINALLY INCLUDED IN THE CRITERION MEASURE. ALL INFORMATION RELEVANT TO EACH STATION WAS RECORDED ON A ROUGH FORM IN COLUMNS. THE INFORMATION INCLUDED:

- 1) DIRECTIONS TO THE EXAMINEE
- 2) DIRECTIONS TO THE EXAMINER
- 3) COMPONENTS NECESSARY
- 4) DIRECTIONS AS TO LOCATION AND MODIFICATION OF COMPONENTS
WHEN NECESSARY
- 5) TENTATIVE ITEMS TO BE SCORED
- 6) STANDARDS FOR SCORING EACH ITEM

THE RATIONALE FOLLOWED FOR ITEM TYPES WAS THAT WHICH HAS PROVED SUCCESSFUL IN CONSTRUCTING EXAMINATIONS OF OTHER TYPES. THESE CAN BE DISTINGUISHED AT THREE LEVELS:

CONFIDENTIAL

CONFIDENTIAL

- 1) ITEMS REQUIRING KNOWLEDGE OF FACTS INCLUDING:
 - (A) NOMENCLATURE
 - (B) MATERIALS
 - (C) TOOLS
 - (D) ROUTINE CHECKS
- 2) ITEMS REQUIRING THE APPLICATION AND USE OF INFORMATION, SUCH AS:
 - (A) OPERATIONS OF A ROUTINE NATURE
 - (B) MAKING FAIRLY FINE DISCRIMINATIONS
 - (C) GIVEN DATA TO SIMPLE PROBLEMS - DRAWING CONCLUSIONS
 - (D) RECOGNIZING DISCREPANCIES IN COMMON COMPONENTS
- 3) ITEMS REQUIRING INSIGHT INTO BASIC REASONS INCLUDING:
 - (A) "WHY" QUESTIONS
 - (B) "KNOW HOW"
 - (C) DRAWING INFERENCES
 - (D) SOLVING PROBLEMS IN UNFAMILIAR CONTEXT
 - (E) UNDERSTANDING PRINCIPLES

AS CAN BE GATHERED FROM A CLOSE EXAMINATION OF THE FINAL RECORDING FORM OF THE CRITERION MEASURE THESE THREE TYPES OF ITEMS WERE INCLUDED AT VARYING LEVELS OF DIFFICULTY. FOR INSTANCE, NOT ALL ITEMS REQUIRING KNOWLEDGE OF FACTS WERE PITCHED AT EASY LEVELS. FACTS WHICH A SEAMAN APPRENTICE COULD REASONABLY BE EXPECTED TO KNOW AS WELL AS THOSE FAMILIAR ONLY TO HIGHER LEVEL PETTY OFFICERS WERE BUILT INTO ITEMS.

AS EACH ITEM WAS SUGGESTED FOR INCLUSION IT WAS REVIEWED FOR RELEVANCE TO THE MINEMAN'S JOB, AND FOR THE POSSIBILITY OF OBJECTIVE SCORING. WHEREVER A PROBLEM AROSE CONCERNING THE VALIDITY OF INCLUDING THE ITEMS, IT WAS SUBJECTED TO EXPERT JUDGES FOR REVISION. THE ITEMS, OF COURSE,

CONFIDENTIAL

CONFIDENTIAL

VARIED IN HOW EASY THEY WERE TO SCORE CONSISTENTLY; AN ITEM THE SCORING OF WHICH DEPENDED ON WHETHER A MAN CONNECTED A PARTICULAR WIRE TO A GIVEN TERMINAL PRESENTED NO JUDGMENTAL PROBLEMS. BUT, SUCH AN ITEM AS THE FIRST ONE IN THE STATION 3 (CD-14 SETTING) WHICH WAS WORDED "DOES NOT USE SETTING TOOL BEFORE REMOVING DIAL" REQUIRED SOME INDICATION AS TO THE MEANING OF THE WORD USE. THIS COULD BE INTERPRETED TO MEAN "PICKS UP SETTING TOOLS" OR A VARIETY OF THINGS SUCH AS "TOUCHES CD-14 WITH SETTING TOOL" "MANIPULATES OR ATTEMPTS TO MANIPULATE CAMS WITH SETTING TOOL".

IN ORDER TO MAKE OBJECTIVE, CONSTANT SCORING POSSIBLE FROM MAN TO MAN, DIRECTIONS TO THE EXAMINER WERE INCLUDED IN TERMS OF A SCORING INSTRUCTION OR STANDARD. FOR EXAMPLE IN THE CASE OF THE ITEM REFERRED TO ABOVE THE INSTRUCTION "NO CREDIT IF HOLE IN SETTING TOOL IS PLACED ON A PIN" ACCOMPANIED THE ITEM.

IT IS OF COURSE IMPOSSIBLE TO ANTICIPATE ALL MISINTERPRETATIONS BUT IN THE DEVELOPMENTAL STAGES OF STATION CONSTRUCTION EVERY EFFORT WAS MADE TO ACHIEVE A RELIABLE SCORING GUIDE.

AS CAN BE SEEN ON THE FINAL FORM OF THE EXAMINATION (APPENDIX B) MUCH OF THE INFORMATION RECORDED ON THE ROUGH FORM IN COLUMNS WAS TRANSFERRED TO THE SCORING FORMS.

THE ADMINISTRATIVE DIRECTIONS PREPARED FOR THE EXAMINERS WERE DESIGNED TO PREVENT AN EXAMINEE'S EARLY FAILURE FROM PENALIZING HIM ON LATER ITEMS. FREQUENTLY, THE EXAMINEE WAS GIVEN DIRECTIONS TO TELL THE EXAMINER WHEN

CONFIDENTIAL

CONFIDENTIAL

HE HAD FINISHED A CERTAIN OPERATION. THE EXAMINER COULD SCORE THE OPERATION AND THEN IF NECESSARY MAKE ANY CHANGE NECESSARY FOR A SUCCESSFUL COMPLETION OF THE NEXT STEP.

C) ITEM REVIEW AND REVISION

THE STATIONS IN ROUGH DRAFT UNDERWENT THREE SEPARATE REVIEWS:

(1) REVIEW FROM SUBJECT MATTER STANDPOINT, (2) REVIEW FROM TEST CONSTRUCTION STANDPOINT, AND (3) FINAL REVIEW BY REPRESENTATIVES OF THE BUREAU OF ORDNANCE, DEPARTMENT OF THE NAVY.

THE REVIEW FOR SUBJECT-MATTER REQUIRED FREQUENT REFERENCES TO RELEVANT OP'S AND OTHER MANUALS. FROM A TEST CONSTRUCTION POINT OF VIEW, THE OBJECTIVITY OF SCORING, PRACTICALITY OF MAKING THE NECESSARY OBSERVATIONS, AND THE WORDING OF DIRECT QUESTIONS TO THE EXAMINEE WERE SCRUTINIZED. IN ADDITION, CERTAIN ADMINISTRATIVE PROBLEMS HAD TO BE ANTICIPATED. FOR EXAMPLE, THE EXAMINER IN STATION 8 WAS DIRECTED TO DISCONNECT A LEAD TO THE SEARCH COIL BEFORE STARTING A MINEMAN ON THE TEST. THIS PREVENTED ACCIDENTAL OPERATION OF THE FIRING MECHANISM BEFORE THE TEST PROTOCOL REQUIRED IT. A DIRECTION TO CONNECT THE SEARCH COIL AT THE APPROPRIATE TIME WAS ALSO NECESSARY. THE FINAL REVIEW BY REPRESENTATIVES OF BUORD NOT ONLY GENERALLY INCREASED THE CHANCES OF ERRORS BEING RECTIFIED BUT ALSO ALLOWED FOR INCLUSION OR EXCLUSION ON THE BASIS OF RECENT CHANGES NOT YET INCORPORATED IN THE OP'S.

CONFIDENTIAL

CONFIDENTIAL

CHAPTER V

PREPARATION FOR CRITERION ADMINISTRATION

THE PROJECT LIAISON OFFICER, IN COMPANY WITH THE CONTRACTOR'S REPRESENTATIVE, MADE ARRANGEMENTS WITH THE EXECUTIVE OFFICERS OF U. S. NAVAL SCHOOLS, MINE WARFARE AND THE U. S. NAVAL MINE DEPOT, YORKTOWN, VIRGINIA TO PROVIDE FOR THE ADMINISTRATION OF THE CRITERION MEASURE.

A) INITIAL ASSEMBLY

THE NECESSARY EXAMINATION ROOMS, MINE COMPONENTS, AS WELL AS EXAMINERS AND EXAMINEES WERE MADE AVAILABLE FOR PROJECT USE. SOME MENTION SHOULD BE MADE OF EACH OF THESE IN TURN.

PERSONNEL ENGAGED IN THE PROJECT WERE FORTUNATE TO HAVE ARRIVED AT THE MINE DEPOT AT A TIME WHEN FOUR ROOMS WERE AVAILABLE, THE CHARACTERISTICS OF WHICH WERE MOST APPROPRIATE FOR ADMINISTERING THE CRITERION MEASURE. THE ROOMS PROVIDED WERE FREE FROM OUTSIDE DISTRACTIONS, WERE WELL-LIGHTED, AND WERE SUPPLIED WITH PLENTY OF ELECTRICAL RECEPTACLES. THE SEPARATION OF THE ROOMS MADE IT POSSIBLE TO AVOID WHISPERING QUESTIONS AND ANSWERS. IN THE EXAMINATION, THE EXAMINER FREQUENTLY ASKED FOR AND RECEIVED ORAL REPORTS FROM EXAMINEES; IN THE PHYSICAL PLANT PROVIDED, OVERHEARING OF THESE BY OTHER EXAMINEES WAS ELIMINATED.

THE MINE COMPONENTS NECESSARY WERE ASSEMBLED IN THE RESEARCH ROOMS AND ARRANGED SO THAT THREE OF THE ROOMS CONTAINED TWO STATIONS AND ONE HELD THREE. THE GEAR WAS MODIFIED WHERE NECESSARY AND SET UP FOR ADMINISTRATION. (THE MODIFICATIONS ARE DESCRIBED IN APPENDIX B.)

CONFIDENTIAL

CONFIDENTIAL

A REQUEST WAS MADE AND APPROVED FOR EXAMINERS TO BE HIGH LEVEL PETTY OFFICERS. THESE EXAMINERS WERE OBTAINED FROM THE MINE DEPOT.

THE ARRANGEMENTS FOR SUBJECTS INCLUDED THE SCHEDULING OF MINEMEN FROM THE MINE WARFARE SCHOOL AND FROM THE MINE DEPOT. THE SCHOOL SUPPLIED 15 MEN OF DIFFERENT RATES FOR A PRELIMINARY TRYOUT OF THE MEASURES AND ALSO 13 MEN WHO WERE INCLUDED IN THE FINAL ADMINISTRATION OF THE CRITERION TO 111 MINEMEN. THE REST OF THESE MEN WERE FROM THE DEPOT.

B) PRELIMINARY TRYOUT

AFTER THE RESEARCH ROOMS AND APPARATUS WERE PREPARED, A PRELIMINARY TRYOUT WAS COMPLETED. THIS ADMINISTRATION TO 15 MINEMEN WAS CARRIED OUT TO SERVE THE MULTIPLE PURPOSES OF: (1) EXAMINER TRAINING, (2) APPARATUS CHECK, (3) CLARIFICATION OF ADMINISTRATIVE PROBLEMS OF ROUTING, ETC., AND (4) CRITERION FORM REVISION.

THE 15 SUBJECTS FOR THIS TRYOUT RANGED FROM MNC'S WHO WERE INSTRUCTORS AT THE MINE WARFARE SCHOOL TO MNSN WHO WERE JUST STARTING AN ELEMENTARY COURSE IN MINE WARFARE. MEN OF DIVERGENT ABILITIES WERE REQUESTED SINCE THE PROBLEMS INVOLVED IN PRESENTING A PERFORMANCE EXAMINATION TO EXPERTS AND TYROS ARE QUITE DISSIMILAR.

THE FIVE EXAMINERS FAMILIARIZED THEMSELVES WITH THE TENTATIVE RECORDING FORMS BEFORE THIS TRYOUT STARTED. THEY ALSO ACTED AS SUBJECTS FOR EACH OTHER, ONE OF THE BEST WAYS OF BECOMING FAMILIAR WITH A PROGRAM

CONFIDENTIAL

CONFIDENTIAL

SUCH AS THIS. FREQUENT CRITIQUES OF THEIR BEHAVIOR IN ADMINISTERING THE STATIONS ASSIGNED TO THEM WERE HELD IN THIS PERIOD. EACH EXAMINER WAS ASSIGNED TO TWO STATIONS IN A GIVEN ROOM WHILE THE RESPONSIBILITY FOR THE NINTH STATION WAS ASSUMED BY THE EXAMINER IN CHARGE WHO ALSO PRESENTED AN INTRODUCTORY STATEMENT TO THE MINEMEN SUBJECTS AND SUPERVISED THEIR MOVEMENT FROM STATION TO STATION.

AFTER THE EXAMINERS HAD A CHANCE TO ADMINISTER THE STATIONS TO THE TRYOUT GROUP A CONFERENCE WAS HELD WITH THE CONTRACTOR'S REPRESENTATIVE. DURING THIS MEETING, SUGGESTED CHANGES WERE NOTED AND DISCUSSED, AND FURTHER CRITIQUING TOOK PLACE. THE CONCEPTS OF RELIABILITY, VALIDITY, AND OBJECTIVITY OF RECORDING WERE ALSO DISCUSSED. EMPHASIS WAS PUT ON PRESENTING A STATION TO EACH SUBJECT IN THE SAME WAY. FREQUENT EXAMPLES WERE GIVEN, SUCH AS HAVING THE SWITCHES ON THE PANEL OF A TEST SET IN THE SAME POSITION FOR EACH EXAMINEE OR INSURING THAT TOOLS WERE PRESENTED IN EQUIVALENT CONDITION EACH TIME THEY WERE USED. IT WAS POINTED OUT THAT VIGILANCE WAS NECESSARY HERE; TOOLS, FOR INSTANCE, REQUIRE FREQUENT SHARPENING.

THE 15 SUBJECT PRELIMINARY TRYOUT MADE IT POSSIBLE TO CHECK THE OPERATION OF THE GEAR USED IN THE RESEARCH. INFORMATION GATHERED DURING THIS PERIOD MADE IT POSSIBLE TO ANTICIPATE APPARATUS PROBLEMS AND TO BE PREPARED TO SUBSTITUTE EXTRA COMPONENTS. TWO CHANGES INCORPORATED IN THE FINAL FORM OF THE CRITERION MEASURES REFLECT THIS ADVANTAGE. IN THIS PERIOD IT WAS DISCOVERED THAT THE FIRING MECHANISM OF THE MINE Mk 36 Mod 1

CONFIDENTIAL

CONFIDENTIAL

WAS SENSITIVE TO INFLUENCES NEAR THE STATION; AS A RESULT A LEAD TO THE SEARCH COIL WAS DISCONNECTED FOR THE FINAL FORM AND THE DIRECTIONS REVISED ACCORDINGLY. THE PLAN TO HAVE ONE EXTRA COPY OF THE CD-14 MECHANISM EMPLOYED WAS REVISED UPWARD SINCE THE TRYOUT SUGGESTED THAT THIS COMPONENT WAS SUBJECT TO DAMAGE BY INEXPERIENCED SUBJECTS.

IN ADDITION TO EXAMINER TRAINING AND APPARATUS CHECKS THE TRYOUT MADE IT POSSIBLE TO CLARIFY SUCH ADMINISTRATIVE PROBLEMS AS THE ROUTING OF SUBJECTS THROUGH THE EXAMINATION ROOMS. THE RESULTS OF THE TRYOUT POINTED TO THE NEED FOR AN EXTRA EXAMINER TO ALLOW THE EXAMINER IN CHARGE MORE OPPORTUNITY TO KEEP A CAREFUL CHECK ON ROUTING AND THE SECURITY OF SCORING FORMS. AS A RESULT BEFORE THE FINAL EVALUATION OF III MINEMEN A SIXTH EXAMINER WAS TRAINED IN THE ADMINISTRATION OF ALL STATIONS. AN ADVANTAGE OF THIS ADDITION WAS THAT IT MADE AN EXAMINER AVAILABLE TO TAKE THE PLACE OF ONE CALLED OUT ON WATCH OR SICK CALL. THE EXPERIENCE GAINED IN THIS TRYOUT ALSO CONFIRMED THE JUDGEMENT THAT MINEMEN SHOULD BE STARTED ON ONE OF THE EASIER STATIONS.

PERHAPS THE MOST IMPORTANT RESULT OF THE PRELIMINARY TRYOUT WAS THE OPPORTUNITY PROVIDED TO REVISE THE CRITERION MEASURE. NO AMOUNT OF NON-OPERATIONAL PLANNING WILL ERADICATE THE "BUGS" LIKELY TO ARISE IN THE OPERATIONAL SITUATION. A LIVE "FULL-DRESS REHEARSAL" IS REQUIRED IN ANY TESTING PROGRAM OF THIS NATURE.

THE EXAMINERS WERE ORIENTED BEFORE THE PRELIMINARY TRYOUT PERIOD THAT

CONFIDENTIAL

CONFIDENTIAL

REVISION WOULD BE NECESSARY. THEY WERE DIRECTED TO BE ON THE ALERT FOR INDICATIONS OF THE NECESSITY FOR CHANGES. BOTH THE EXAMINERS AND THE CONTRACTOR'S REPRESENTATIVE MADE OBSERVATIONS IN THIS PERIOD WHICH RESULTED IN CHANGES MADE FROM FOUR POINTS OF VIEW.

- (1) ITEM ADDITION: THIS INCLUDED BUILDING INTO SCORABLE ITEMS OBSERVED CRITICAL BEHAVIORS AND COMMON MISTAKES NOT INCLUDED IN THE PRELIMINARY FORM AS ITEMS.
- (2) ITEM DELETION: THIS STEP INVOLVED DELETING OR CHANGING ITEMS FOUND TO BE SO EASY THAT ALL MEN SUCCESSFULLY PASSED THEM OR SO DIFFICULT THAT NO ONE COMPLETED THEM.
- (3) ITEM CHANGE: THIS INVOLVED TWO FACETS, CHANGES IN DIRECTIONS AND CHANGES IN THE CRITERIA FOR SCORING.
- (4) ITEM ORDER: THIS MODIFICATION CONCERNED THE ADMINISTRATIVE SCORING OF THE ITEM RATHER THAN THE ITEM CONTENT. IT CONSISTED IN A SHIFT IN THE PLACE WHERE AN ITEM WAS SCORED.

SEVERAL MINOR MODIFICATIONS WERE MADE IN THE CRITERION MEASURE FORM AS A RESULT OF EXPERIENCE WITH IT DURING THE TRYOUT. THESE WERE IN THE NATURE OF REVISIONS WHICH MADE THE SCORING FORM EASIER TO USE.

CONFIDENTIAL

CONFIDENTIAL

CHAPTER VI

OVERVIEW OF THE CRITERION STATIONS

THIS CHAPTER PRESENTS A SHORT DESCRIPTION AND A PICTURE OF EACH OF THE NINE STATIONS FINALLY DEVELOPED FOR THE CRITERION MEASURE. THESE ARE PRESENTED TO GIVE A GENERAL IDEA OF THE FINAL PRODUCT OF THIS PROJECT. MORE SPECIFIC INFORMATION ABOUT EACH STATION WILL BE FOUND IN APPENDIX B.

EACH MORNING OF ADMINISTRATION A GROUP OF MINEMEN REPORTED TO THE RESEARCH ROOMS AND WERE GIVEN AN ORIENTATION TO THE PROJECT. THE MNC IN CHARGE ORALLY PRESENTED THE FOLLOWING INITIAL BRIEFING:

"SOME OF YOU ARE PROBABLY WONDERING WHAT THIS IS ALL ABOUT. IF YOU WILL GIVE ME YOUR ATTENTION I'LL GIVE YOU A RUN-DOWN OF THE EXAMINATION YOU WILL TAKE TODAY.

"THE EXAMINATION IS BEING MADE UP BY A CIVILIAN RESEARCH OUTFIT AS A MEASURE OF MINEMEN'S ABILITY. THEY NEED YOUR HELP IN MAKING IT A BETTER EXAMINATION. YOU CAN HELP BY PAYING CLOSE ATTENTION TO DIRECTIONS AND FOLLOWING THEM THE BEST WAY YOU KNOW HOW.

"THE PURPOSE OF THE EXAMINATION IS TO FIND OUT HOW WELL A MINEMAN CAN DO SOME OF THE IMPORTANT JOBS THAT ARE ASSIGNED TO HIM. IT IS NOT A SPEED TEST. IT IS THE TYPE OF EXAMINATION THAT IS SOMETIMES CALLED A PRACTICAL FACTORS EXAM OR A PERFORMANCE TEST. IT IS NOT A PAPER AND PENCIL TEST. YOU WILL BE ASKED TO DO JOBS LIKE THE ONES YOU HAVE DONE BEFORE. THE SCORE YOU MAKE WILL BE USED ONLY BY THE RESEARCH OUTFIT. THE EXAMINATION

CONFIDENTIAL

CONFIDENTIAL

HAS NOTHING TO DO WITH ADVANCEMENT OR REDUCTION IN RATING. THE SCORES WILL BE REPORTED AS STATISTICS. THEY WILL NOT BE REPORTED BY NAME, AND WILL NOT GO INTO YOUR RECORDS. MOST OF YOU WILL GET A PRETTY GOOD IDEA OF HOW YOU'RE DOING AS YOU GO ALONG. BUT THE EXAMINERS HAVE BEEN TOLD NOT TO GIVE YOU THE SCORE YOU MAKE.

"THE EXAMINATION IS MADE UP OF NINE STATIONS WHICH YOU WILL TAKE IN DIFFERENT ORDERS. AN EXAMINER WILL GO ALONG WITH YOU TO GIVE YOU DIRECTIONS AND WATCH YOU WORK. HE WILL WRITE DOWN WHAT, AND HOW, YOU DO AT EACH STATION. THE WHOLE EXAMINATION WILL TAKE YOU ABOUT FOUR HOURS.

"BEFORE I BRIEF YOU ON THE ACTUAL TAKING OF THE EXAM, ARE THERE ANY QUESTIONS? (PAUSE FOR AND ANSWER QUESTIONS.)

"NOW ABOUT THE TAKING OF THE TEST - WE KNOW THAT MANY OF YOU HAVE NOT RECENTLY, OR PERHAPS NEVER, DONE SOME OF THE JOBS YOU'LL BE ASKED TO DO TODAY. OTHERS YOU'LL KNOW SOMETHING ABOUT, BUT WILL NOT FEEL TOO SHARP ON THEM. REMEMBER THIS HOWEVER, EVERY STATION IS SET UP SO THAT EVERYONE CAN GET SOME POINTS AND PROBABLY NOBODY CAN GET ALL THE POINTS. EVEN IF YOU THINK YOU KNOW NOTHING ABOUT A JOB YOU ARE GIVEN TO DO, GO AHEAD WITH IT THE BEST WAY YOU KNOW HOW. IF YOU GET IN A JAM THE EXAMINER WILL HELP YOU OUT. YOU WILL BE ASKED TO MAKE CERTAIN TESTS; SOMETIMES YOU WILL MAKE THE WHOLE TEST, SOMETIMES ONLY A PART OF IT. YOU WILL SOMETIMES BE GIVEN DIRECTIONS TO TELL THE EXAMINER WHEN YOU HAVE FINISHED CERTAIN STEPS - BE SURE TO DO THIS. WHEN YOU DO HE WILL DO ONE OF SEVERAL THINGS:

CONFIDENTIAL

CONFIDENTIAL

1. HE MAY ASK YOU QUESTIONS
2. HE MAY SCORE WHAT YOU HAVE DONE UP TO THAT TIME
3. HE MAY SET YOU UP FOR THE NEXT STEP.

"THE EXAMINER MAY INTERRUPT YOU AT ANY TIME TO DO ANY OF THESE THINGS. I TOLD YOU THAT THIS IS NOT A SPEED TEST, BUT WE DO WANT TO KEEP THE THING MOVING SO DON'T WASTE ANY TIME. WE DON'T WANT ANY BOTTLE-NECKS TO OCCUR.

"SOME OF THE DIRECTIONS YOU GET WILL BE PRINTED ON CARDS, BE SURE THAT YOU READ ALL THE DIRECTIONS BEFORE YOU START TO DO ANYTHING. READ EVERYTHING ON THE CARD WHEN IT IS FIRST GIVEN TO YOU. YOU MAY ASK THE EXAMINER QUESTIONS IF ANYTHING IS NOT CLEAR TO YOU. MAKE SURE YOU UNDERSTAND WHAT TO DO BEFORE DOING IT.

"AS YOU MIGHT EXPECT SOME OF THE GEAR YOU WILL WORK WITH HAS BEEN MODIFIED, BUT IF YOU ARE TOLD THE GEAR IS IN WORKING ORDER YOU CAN BELIEVE IT. BUT EVEN IF YOU ARE TOLD THE GEAR IS O.K., YOU SHOULD MAKE THE USUAL ROUTINE CHECKS.

"NOW WE WANT TO GET SOME INFORMATION FROM YOU ABOUT YOUR EXPERIENCE. FILL OUT THESE FORMS. (PASS FORMS.) RAISE YOUR HAND IF YOU HAVE ANY QUESTIONS."

THE MINEMEN WERE THEN INTRODUCED TO THE EXAMINER WHO STARTED THEM OFF ON THEIR FIRST STATION. EACH MINEMAN WAS ROUTED FROM EXAMINER TO EXAMINER AS HE FINISHED THE TWO STATIONS ADMINISTERED BY EACH. AS EACH

CONFIDENTIAL

CONFIDENTIAL

MAN STARTED HIS FIRST STATION, A SPECIAL EFFORT WAS MADE BY THE EXAMINER TO PUT HIM AT EASE AND TO ESTABLISH A COMFORTABLE ATMOSPHERE.

IT SHOULD BE NOTED THAT EACH STATION WAS STRUCTURED SO THAT A FAILURE IN EARLY STEPS WOULD IN NO WAY PREVENT THE SUBJECT FROM GETTING A SCORE ON LATER ITEMS.

THE READER MAY FIND IT HELPFUL TO REFER TO THE PRINTED RECORDING FORM FOR EACH STATION WHILE READING THE REST OF THIS CHAPTER. THESE FORMS WILL BE FOUND IN APPENDIX B.

CONFIDENTIAL

CONFIDENTIAL

BATTERY LOAD TEST STATION I

CONFIDENTIAL

CONFIDENTIAL

BATTERY LOAD TEST STATION I

THIS STATION WAS DESIGNED TO MEASURE A MINEMAN'S ABILITY TO PREPARE AND USE TEST SET MK 61 MOD 1 IN A ROUTINE MANNER. THE STATION INVOLVED THREE MAJOR PARTS: (A) IDENTIFICATION OF COMPONENTS, (B) PREPARATION OF THE TEST SET, AND (C) MAKING THE LOAD TEST ON BA 241/U. ONE ASPECT OF A MINEMAN'S PERFORMANCE WHICH WAS RATHER HEAVILY WEIGHTED AT THIS STATION WAS THE MAKING OF NECESSARY ROUTINE VISUAL CHECKS. AS CAN BE SEEN IN THE PHOTOGRAPHS THE NOMENCLATURE ON EACH COMPONENT WAS COVERED WITH MASKING TAPE. THE WIRING OF THE TEST SET WAS MODIFIED SLIGHTLY SO THAT WHEN THE SELECTOR SWITCH WAS PLACED IN A GIVEN POSITION THE APPROPRIATE METER READING WAS PREDETERMINED. THE DIRECTIONS GIVEN TO THE SUBJECT ON CARDS WERE A SLIGHTLY EDITED VERSION OF MATERIAL DRAWN FROM THE RELEVANT OP AND WERE PHRASED IN THE STYLE OF THE OP DIRECTIONS.

CONFIDENTIAL

CONFIDENTIAL



FIGURE 1. STATION I

CONFIDENTIAL

CONFIDENTIAL

M-II SCHEMATIC READING STATION 2

CONFIDENTIAL

CONFIDENTIAL

M-II SCHEMATIC READING STATION 2

AT THIS STATION EACH MINEMAN WAS GIVEN AN OPPORTUNITY TO DEMONSTRATE HIS KNOWLEDGE OF A SAMPLING OF SIMPLE ELECTRONIC ASPECTS OF THE M-II FIRING MECHANISM. THE FUNCTIONS TESTED INCLUDED:

- A) SCHEMATIC DIAGRAM READING
- B) USE OF RESISTOR COLOR CODE
- C) USE OF OHM'S LAW IN MAKING A BREADBOARD CIRCUIT
- D) MAKING A SIMPLE HOOK-UP FROM A WIRING DIAGRAM

THE EMPHASIS WAS NOT SO MUCH ON "DOES HE KNOW" AS IT WAS ON "CAN HE DO". FOR EXAMPLE, THE DIRECTIONS REQUIRED THE MINEMAN TO USE OHM'S LAW IN DETERMINING THE VOLTAGE AT GIVEN POINTS ON A BREADBOARD CIRCUIT. THREE DIFFERENT BREADBOARDS WERE EMPLOYED AT THIS STATION, A PHOTOGRAPH OF THEM APPEARS IN APPENDIX B. THE SCHEMATIC DIAGRAM USED WAS A 15 BY 20 INCH ENLARGEMENT OF FIGURE 3, OP 681 (CHANGE 1).

CONFIDENTIAL

CONFIDENTIAL

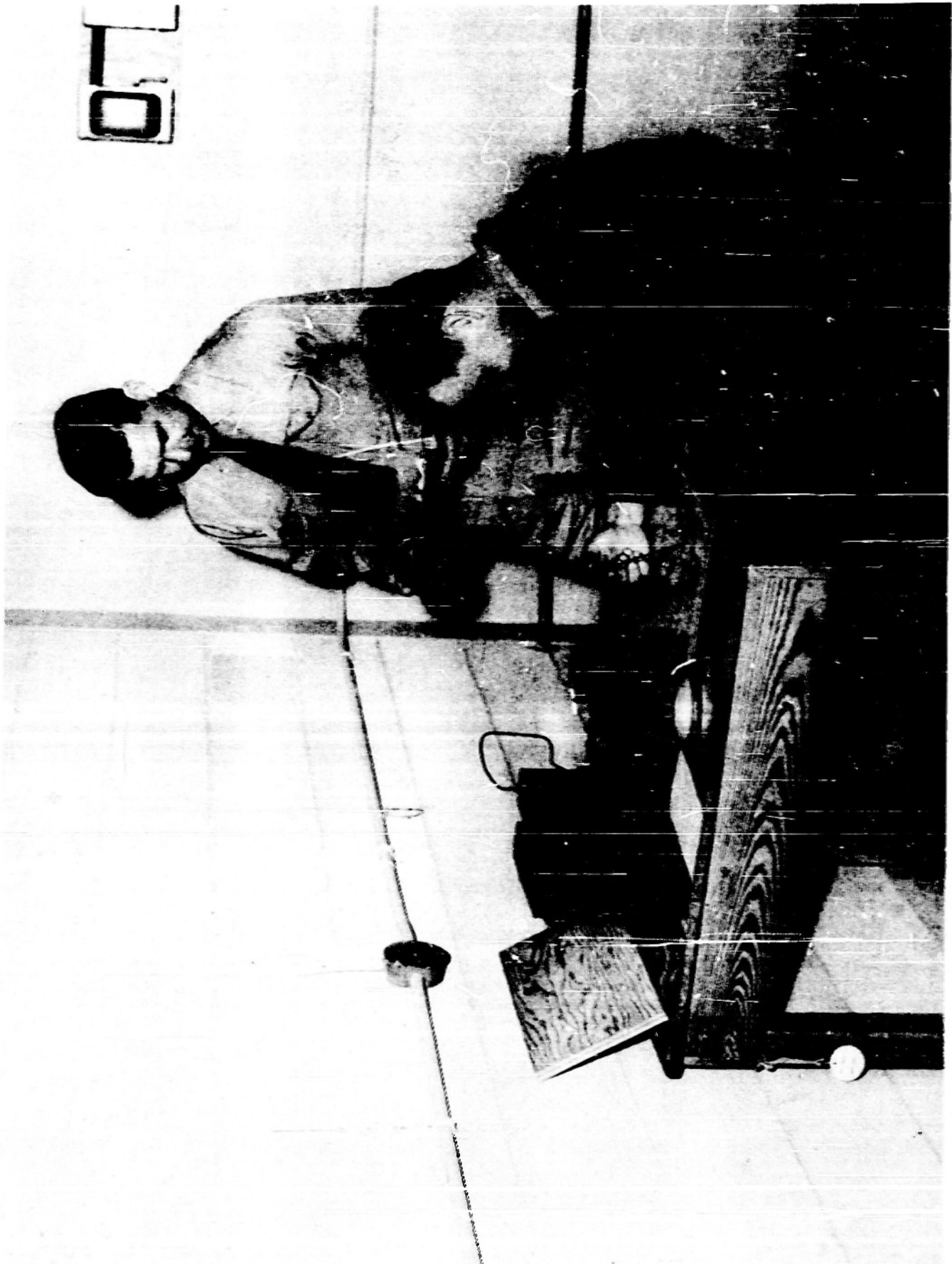


FIGURE 2. STATION 2

CONFIDENTIAL

CONFIDENTIAL

CD-14 SETTING STATION 3

CONFIDENTIAL

CONFIDENTIAL

CD - 14 SETTING STATION 3

THERE WERE TWO PARTS TO THIS STATION, THE FIRST EMPLOYED A CD-14 MECHANISM AND THE SECOND A SCHEMATIC DIAGRAM. THE PROBLEM REQUIRED THE MINEMAN TO SET THE MECHANISM USING DATA PRESENTED IN A CONTEXT DIFFERENT FROM THE USUAL. THE COMPLEXITY OF THE MINEMAN'S ^LBILLET AND THE READING OF OP'S REQUIRED THAT THE MINEMAN FREQUENTLY ABSTRACT RELEVANT INFORMATION FROM A BACKGROUND OF IRRELEVANT DATA. TWO OF THE CRITICAL ITEMS OF THIS STATION EVALUATED THE ABILITY TO DO THIS. OTHER OPERATIONS REQUIRED IN THE CD-14 SETTING WERE MORE ROUTINE. IN THE SECOND PART OF THE STATION THE EMPHASIS WAS ON TRACING THE CIRCUITS OF AN ENLARGEMENT OF FIGURE 10, PAGE 26, OP 956.

CONFIDENTIAL

CONFIDENTIAL

1954 MAY 2 1954
1 2 3 4 5 6
7 8 9 10 11 12
13 14 15 16 17 18
19 20 21 22 23 24
25 26 27 28 29
30 31
1954 MAY 1954
1 2 3
4 5 6 7 8 9 10
11 12 13 14 15 16 17
18 19 20 21 22 23 24
25 26 27 28 29 30
31
1954 MAY 1954
1 2 3 4 5 6 7 8
9 10 11 12 13 14 15
16 17 18 19 20 21 22
23 24 25 26 27 28 29
30 31



FIGURE 3. STATION 3

CONFIDENTIAL

CONFIDENTIAL

TUBE STRAP MANUFACTURE STATION 4

CONFIDENTIAL

CONFIDENTIAL

TUBE STRAP MANUFACTURE STATION 4

THE MINEMAN'S SELECTION AND USE OF SOME COMMON HAND TOOLS WAS TESTED AT THIS STATION. HIS ABILITY TO ABSTRACT INFORMATION FROM A SIMPLE ORDNANCE DRAWING WAS ALSO CHECKED. THE MINEMAN WAS PRESENTED WITH A PIECE OF METAL STOCK, THE DRAWING, AND DIRECTIONS TO FABRICATE A TUBE STRAP (SEARCH COIL RETAINING BAR) UP TO THE POINT OF DRILLING HOLES. THE OPERATIONS INVOLVED WERE (A) MAKING A LAYOUT OF THE FOUR HOLES ON THE BAR, (B) SCRIBING AND CUTTING THE BAR TO LENGTH AND (C) TRIMMING IT WITH A FILE. THE FINAL PRODUCT AT THIS STATION WAS SCORED USING A TRANSPARENT PLASTIC JIG MADE TO THE TOLERANCES INDICATED ON BUORD DWG 415913.

CONFIDENTIAL

CONFIDENTIAL



FIGURE 4. STATION 4

CONFIDENTIAL

CONFIDENTIAL

FIRING MECHANISM M-5 STATION 5

CONFIDENTIAL

CONFIDENTIAL

FIRING MECHANISM M-5 STATION 5

THE EVALUATIONS MADE AT THIS STATION INCLUDED THE MINE-
MAN'S (A) FAMILIARITY WITH FUSING THE M-5 FIRING MECHANISM,
(B) HIS USE OF AN OHMMETER FOR TROUBLESHOOTING, AND (C) HIS
CAREFULNESS IN MAKING A FINAL INSPECTION. FOR ADMINISTRATIVE
REASONS THE USE OF A MICROMETER WAS APPENDED HERE. IN THE
EXAMINERS' JUDGEMENT AND AS SUGGESTED BY AN ANALYSIS OF STA-
TIONS THE M-5 WAS LESS FAMILIAR TO MINEMEN THAN OTHER FIRING
MECHANISMS EMPLOYED IN THE RESEARCH.

CONFIDENTIAL

CONFIDENTIAL

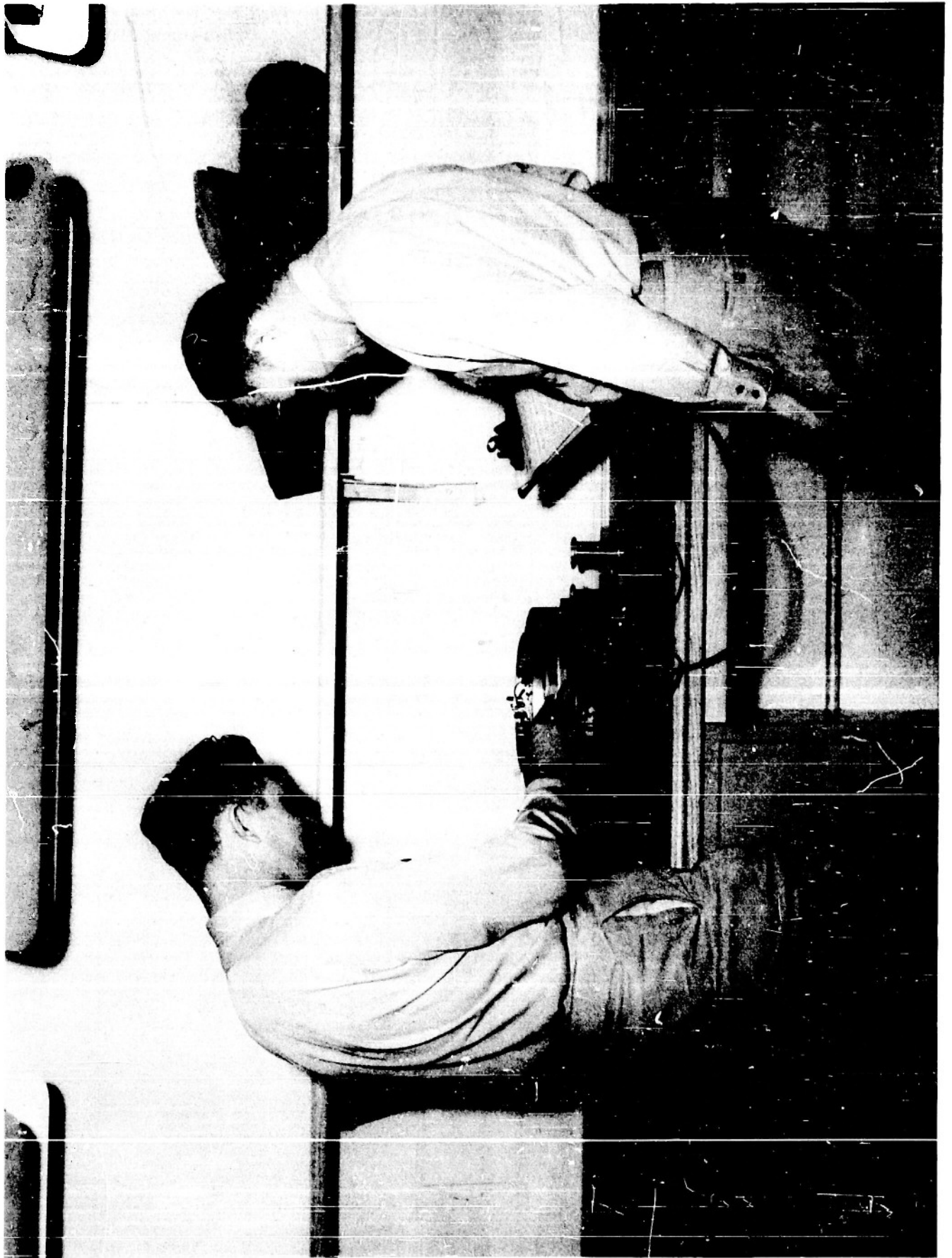


FIGURE 5. STATION 5

CONFIDENTIAL

CONFIDENTIAL

FIRING MECHANISM A-8 STATION 6

CONFIDENTIAL

CONFIDENTIAL

FIRING MECHANISM A-8 STATION 6

AT STATION 6 THE MINEMAN WAS REQUIRED TO PREPARE THE Mk 65 AND THE Mk 66 TEST SETS FOR TESTING THE A-8 FIRING MECHANISM. WHEN THIS WAS COMPLETED HE UNDERTOOK THE SR-9 MOD 0 TIME-OUT TEST. THE PERFORMANCE DESIRED AT THIS STATION WAS SIMILAR IN NATURE TO THAT OF THE BATTERY LOAD TEST. THE DIRECTIONS GIVEN WERE AGAIN OF THE OP VARIETY.

CONFIDENTIAL

CONFIDENTIAL

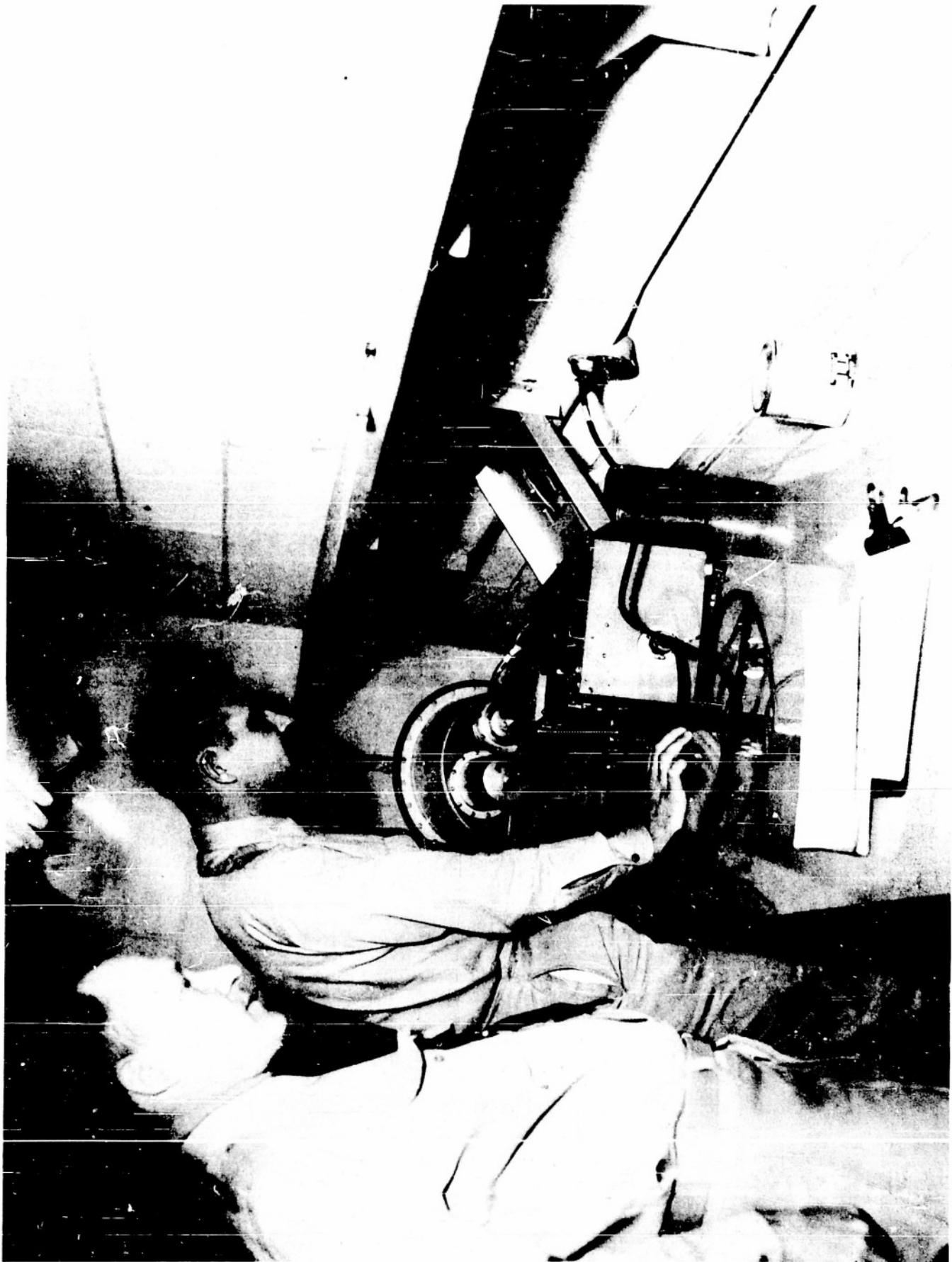


FIGURE 6. STATION 6

CONFIDENTIAL

CONFIDENTIAL

SOLDERING STATION 7

CONFIDENTIAL

CONFIDENTIAL

SOLDERING STATION 7

AT THE SOLDERING STATION THE MINEMAN WAS GIVEN DIRECTIONS TO SOLDER THE LEADS OF A FIVE CONDUCTOR CABLE TO THE PINS OF AN AMPHENOL PLUG. THE ITEMS SCORED INCLUDED SUCH THINGS AS THE CARE OF THE SOLDERING IRON, THE SELECTION AND USE OF MATERIALS FOR SOLDERING, THE MINEMAN'S SOLDERING TECHNIQUE, AND THE QUALITY OF THE FINAL PRODUCT. APPROXIMATELY ONE-THIRD OF THE ITEMS WERE CONCERNED WITH THE FINAL PRODUCT.

CONFIDENTIAL

CONFIDENTIAL



FIGURE 7. STATION 7

CONFIDENTIAL

CONFIDENTIAL

**OPERATIONAL TEST
MINE MK 36 MOD I
STATION 8**

CONFIDENTIAL

CONFIDENTIAL

OPERATIONAL TEST MINE MK 36 MOD I STATION 8

THE MINEMAN'S TASK AT STATION 8 WAS THE COMPLETION OF AN OPERATIONAL TEST IN A NON-ROUTINE CONTEXT. RATHER THAN PRESENTING THE DIRECTIONS IN THE USUAL FORM, THE EXAMINER GAVE THE EXAMINEE INFORMATION RELEVANT TO THE CONDITION OF INSTALLED MINE COMPONENTS AND A DESCRIPTION OF THE TEST SET USED. THE TEST SET DESCRIPTION WAS A SLIGHTLY EDITED VERSION OF SECTION 5.1, OP 1860, MINE AND DEPTH CHARGE TEST SETS. ALL INFORMATION NECESSARY TO THE SUCCESSFUL COMPLETION OF THE OPERATIONAL TEST WAS CONTAINED IN THE MATERIAL PRESENTED. THE MINEMAN'S MAJOR PROBLEM WAS TO DERIVE AND PUT IN PROPER SEQUENCE THE ESSENTIAL STEPS. THE PROBLEM SOLVING SITUATION PRESENTED HERE WAS DESIGNED TO EVALUATE THE MINEMAN'S ABILITY TO FIND, COMPREHEND, AND INTERPRET OP MATERIAL.

CONFIDENTIAL

CONFIDENTIAL



FIGURE 8. STATION 8

CONFIDENTIAL

CONFIDENTIAL

BUTTON-UP STATION 9

CONFIDENTIAL

CONFIDENTIAL

BUTTON-UP STATION 9

THE NINTH STATION, BUTTON-UP, WAS THE SHORTEST IN TERMS OF THE NUMBER OF SCORED ITEMS. HERE, THE MINEMAN WAS DIRECTED TO REMOVE A COVER PLATE, INSPECT THE RUBBER GASKET, AND THEN REPLACE AND SECURE THE COVER PLATE. IN ORDER TO ECONOMIZE IN THE USE OF COMPONENTS AND SPACE, THESE OPERATIONS WERE CARRIED OUT ON THE FORWARD END OF THE MINE CASE OF STATION 8. THE MINEMAN PERFORMED ON THE NOSE FILLING HOLE OF THE MINE Mk 36 Mod 1. THIS JOB REQUIRED THE USE OF A SPEED SOCKET WRENCH AND A TORQUE WRENCH. THE MOST CRITICAL ITEMS CONCERNED THE PROPER SEQUENCE OF STUD TIGHTENING AND RECHECKING.

CONFIDENTIAL

CONFIDENTIAL



FIGURE 9. STATION 9

CONFIDENTIAL

CONFIDENTIAL

AS A LOGICAL CONCLUSION TO THIS OVERVIEW OF THE MINE STATIONS OF THIS CRITERION MEASURE THE READER IS ADVISED TO CONSULT THE GRAPH WHICH ILLUSTRATES THE AVERAGES (MEANS) MADE BY THE DIFFERENT MINEMAN PAY GRADES EVALUATED. THIS GRAPH (FIGURE 10) ALSO SHOWS THE AVERAGE SCORES MADE AT EACH STATION; IT WILL BE FOUND ON PAGE 66.

CONFIDENTIAL

CONFIDENTIAL

CHAPTER VII

RESULTS OF THE ADMINISTRATION OF THE CRITERION MEASURE

THIS CHAPTER PRESENTS THE RESULTS OF THE ADMINISTRATION OF THE CRITERION MEASURE TO 111 MINEMEN AT THE U. S. NAVAL MINE DEPOT, YORKTOWN, VIRGINIA.

THE MINEMEN WERE EVALUATED DURING THE PERIOD 16 MARCH TO 5 FEBRUARY 1954. THE NUMBER TESTED EACH DAY VARIED BECAUSE OF SUCH ROUTINE MATTERS AS PAY DAY, SICK CALL, ETC., BUT AVERAGED ABOUT EIGHT MEN PER WORKING DAY. THE CHARACTERISTICS RECORDED FOR EACH OF THE 111 MINEMEN ARE PRESENTED IN APPENDIX A. THESE DATA INCLUDE PAY GRADE, MONTHS OF SERVICE IN THE NAVY, YEARS OF CIVILIAN EDUCATION, GCT SCORE, AND GRADES MADE IN THE ELEMENTARY MINE WARFARE COURSE GIVEN AT U. S. NAVAL SCHOOLS, MINE WARFARE, YORKTOWN, VIRGINIA.

THE MEN EVALUATED WERE ALL FROM THE DEPOT EXCEPT FOUR MNC'S, FOUR MNI'S, ONE MN2 AND TWO MN3'S WHO WERE DRAWN FROM THE MINE WARFARE SCHOOL. IN APPENDIX A THE RAW DATA SHOWING THE AVERAGES (MEANS) AND VARIABILITY (STANDARD DEVIATIONS) OF EACH PAY GRADE FOR THE PERSONAL CHARACTERISTICS AS WELL AS FOR THE VARIOUS SUB-TEST SCORES IS PRESENTED. THE MEANS AND STANDARD DEVIATIONS OF THE PERSONAL CHARACTERISTICS OF THE MINEMEN ARE SHOWN IN A MORE EASILY COMPARED FORM IN TABLE I.

THE MEN EXAMINED REPRESENT THE MAJORITY OF THE MINEMEN STATIONED AT THE MINE DEPOT. ALL AVAILABLE MEN AT THE DEPOT WERE EVALUATED.

CONFIDENTIAL

CONFIDENTIAL

TABLE I

MEANS AND STANDARD DEVIATIONS OF THE CHARACTERISTICS OF 111 MINEMEN BY PAY GRADE

PAY GRADE	NUMBER OF CASES	MONTHS SERVICE		YEARS CIVILIAN EDUCATION		GCT		ELEM. COURSE* GRADE	
		M	SD	M	SD	M	SD	M	SD
MNC	7	186.71	#	10.14	#	56.00	#	90.00	#
MNI	7	100.57	#	11.57	#	57.43	#	84.43	#
MN2	14	57.64	#	11.71	#	59.50	#	85.50	#
MN3	38	39.58	22.65	11.13	1.25	55.82	5.32	81.55	5.02
MNSN	45	20.95	8.53	11.00	1.33	54.22	4.18	78.20	5.04
TOTAL	111	47.43	47.46	11.12	1.33	55.75	6.30	81.25	6.09

* ELEMENTARY COURSE GRADES ARE BASED ON SCHOOL WORK DONE AT U.S. NAVAL SCHOOL, MINE WARFARE, YORKTOWN, VA.

STANDARD DEVIATIONS NOT REPORTED DUE TO SMALL NUMBER OF CASES.

CONFIDENTIAL

CONFIDENTIAL

FIGURE 10 PRESENTS THE AVERAGE RESULTS (MEANS) OF THE MOST DIRECT SCORING PROCEDURE. THE RAW DATA ON WHICH THIS GRAPH IS BASED ARE THOSE OF APPENDIX A. THESE RAW DATA ARE SIMPLY THE NUMBER OF ITEMS SUCCESSFULLY COMPLETED AT EACH STATION COMBINED INTO A TOTAL SCORE. THE SEGMENTS OF THE BARS ILLUSTRATE THE MEAN NUMBER OF ITEMS, BY STATION, THAT EACH PAY GRADE SUCCESSFULLY COMPLETED. THE WHOLE BAR FOR A GIVEN PAY GRADE CORRESPONDS TO AN AVERAGE OF THE TOTAL NUMBER OF ITEMS PASSED, FOR THAT PAY GRADE. THE TOP BAR SHOWS THE NUMBER OF ITEMS IN EACH STATION THAT MADE UP THE 160 TOTAL POSSIBLE ITEMS. FIGURE 10 SHOWS THE DIFFERENTIAL BETWEEN PAY GRADES ON THE CRITERION MEASURE.

IN ADDITION TO SCORING THE NUMBER OF ITEMS CORRECTLY DONE AT EACH STATION AND COMBINING THESE INTO A TOTAL SCORE FOR EACH MINEMAN, A SECOND SCORING PROCEDURE WAS DEVELOPED. THIS DEVELOPMENT TOOK PLACE CONCURRENTLY WITH THE DEVELOPMENT OF ITEMS AND IS BASED ON THE ITEM TYPES DISCUSSED IN CHAPTER III UNDER THE SECTION ENTITLED "INITIAL PREPARATION OF STATION ITEMS". THIS SCORING PROCEDURE, REFERRED TO HEREIN AS DIAGNOSTIC SCORING, IS ESSENTIALLY A GROUPING TOGETHER OF ITEMS OF THREE KINDS: (1) FACT, (2) PERFORMANCE, AND (3) HIGHER LEVEL, WHY - WHEREFORE TYPES. OF COURSE NOT ALL ITEMS COULD BE CLASSIFIED NEATLY INTO A SINGLE CATEGORY. SOME ITEMS, FOR EXAMPLE, CALLED FOR BOTH FACTS AND PERFORMANCE AND INDEED, FIVE OF THE 160 ITEMS WERE CLASSIFIED AS COMBINING ALL THREE KINDS. THE ITEMS WERE DIVIDED INTO THREE SCALES LABELED HEREIN F (FACT),

CONFIDENTIAL

CONFIDENTIAL

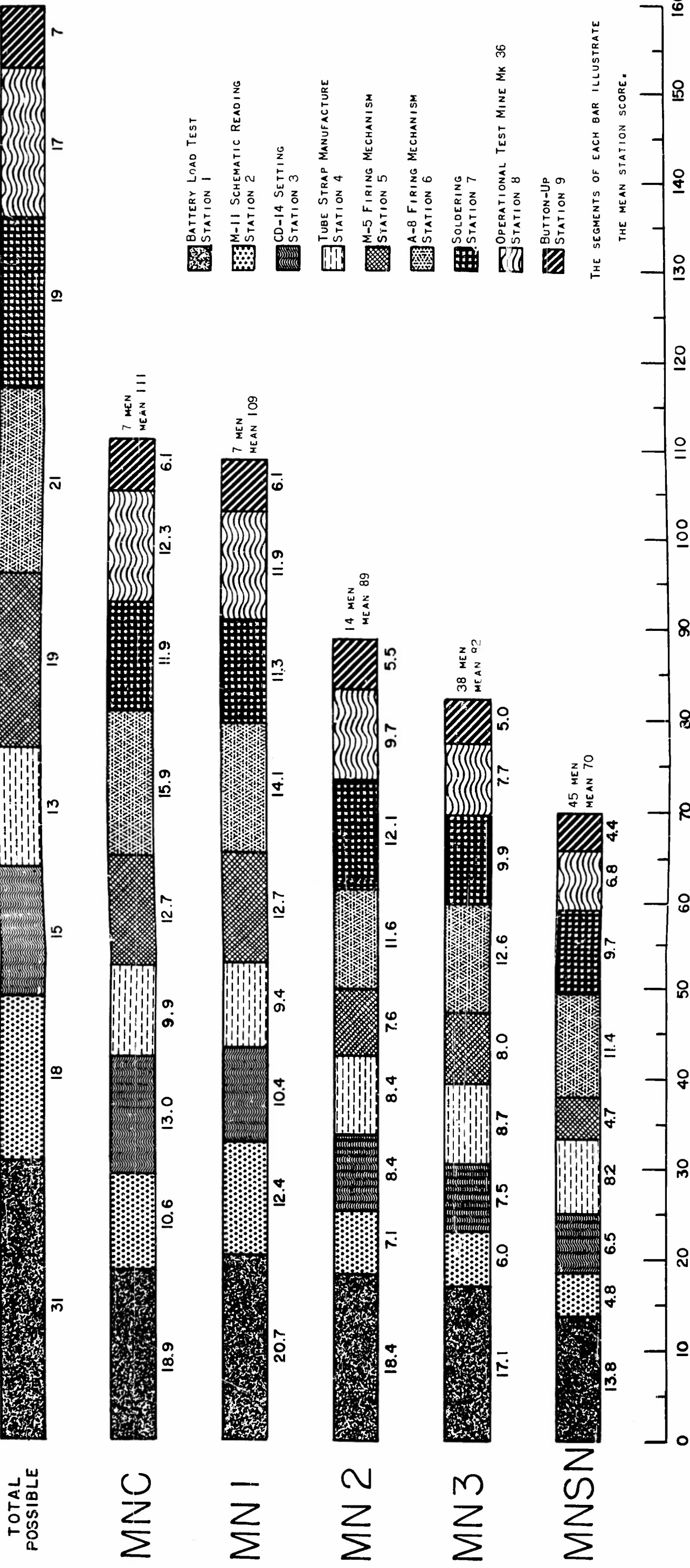


FIGURE 10. CRITERION MEANS FOR EACH PAY GRADE

CONFIDENTIAL

CONFIDENTIAL

P (PERFORMANCE), AND W (WHY WHEREFOR). THE F SCALE, THEN, CONTAINED ALL ITEMS REQUIRING KNOWLEDGE OF A FACT. IF A GIVEN ITEM ALSO REQUIRED PERFORMANCE OR REASONING IT MIGHT APPEAR IN THE OTHER SCALE OR SCALES.

THE F SCALE WAS MADE UP OF ITEMS WHICH WERE CLASSIFIED AND CODED AS FOLLOWS:

SCALE CODE	NUMBER OF ITEMS	
F	20	
FP	29	
FW	11	65 ITEMS TOTAL
FPW	5	

THE P SCALE INCLUDED:

SCALE CODE	NUMBER OF ITEMS	
P	66	
FP	29	
PW	18	118 ITEMS TOTAL
FPW	5	

THE W SCALE WAS MADE UP OF:

SCALE CODE	NUMBER OF ITEMS	
W	11	
FW	11	
PW	18	45 ITEMS TOTAL
FPW	5	

CONFIDENTIAL

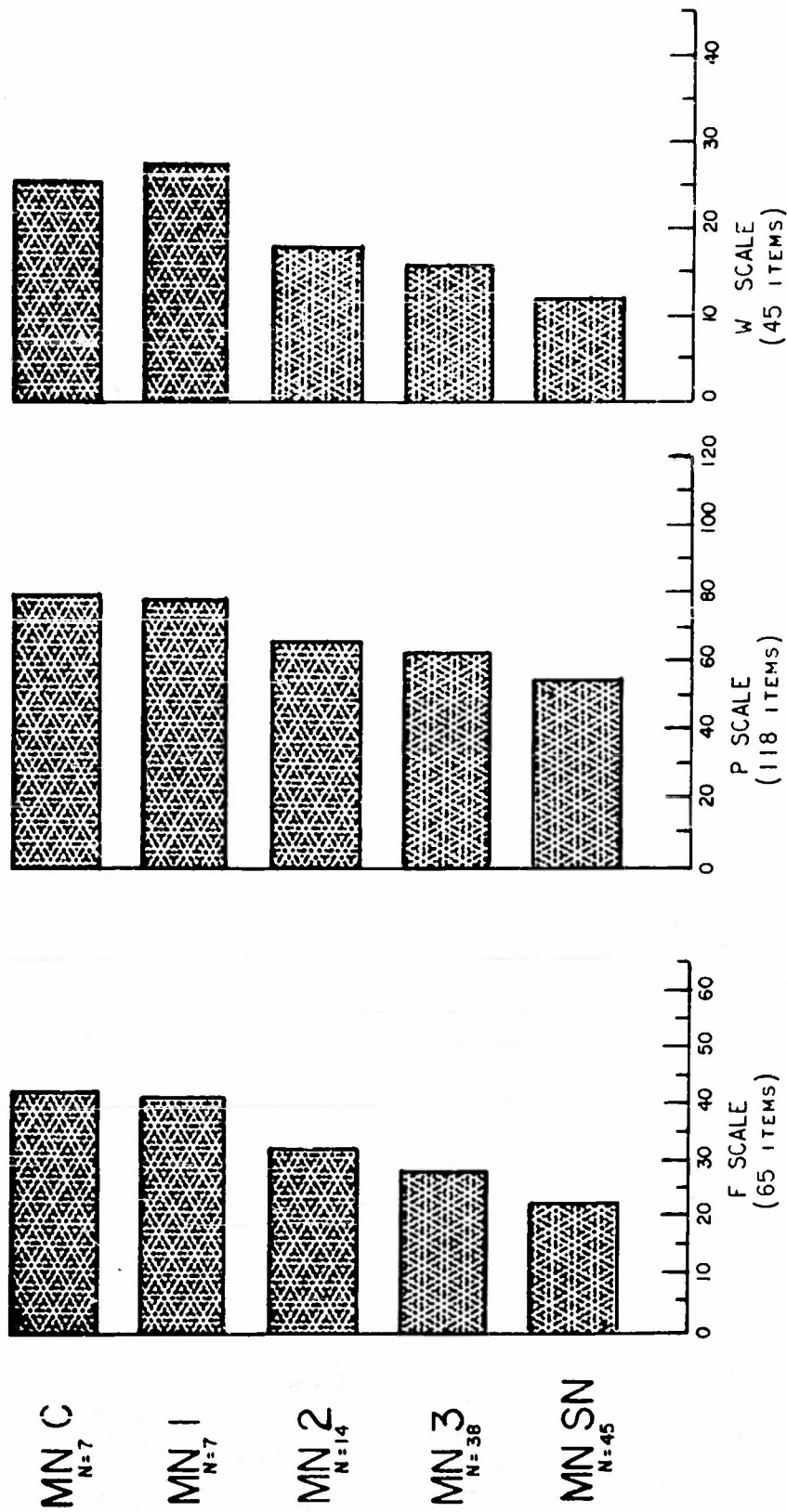


FIGURE II. DIAGNOSTIC SCALE MEANS FOR EACH PAY GRADE

CONFIDENTIAL

REFERENCE TO APPENDIX B, WHERE ITEM CHARACTERISTICS ARE PRESENTED, WILL ALLOW DETERMINATION OF THE SCALE INTO WHICH A GIVEN ITEM WAS CODED.

EACH OF THE III SCORING FORMS RESULTING FROM THE ADMINISTRATION WAS SCORED ON THE THREE SCALES SEPARATELY AND AN F, P, AND W SCORE WAS RECORDED FOR EACH MINEMAN. THESE SCORES WILL BE FOUND IN APPENDIX A WITH THE RAW SCORES. FIGURE II SHOWS THE MEANS OF THESE DATA IN BAR GRAPH FORM FOR EACH OF THE THREE SCALES. A COMPARISON CAN EASILY BE MADE BETWEEN PAY GRADES BY REFERRING TO THIS GRAPH ON PAGE 68.

A WORD ABOUT THE DIAGNOSTIC SCALES IS IN ORDER HERE. THE F SCALE SCORE WOULD SUGGEST HOW MUCH "BOOK KNOWLEDGE" A MINEMAN POSSESSED ABOUT THE CONTENT OF THE CRITERION MEASURE WHILE THE P SCALE SCORE BASED ON THE MAJORITY OF THE ITEMS INDICATES HOW WELL THE MINEMAN CAN PERFORM IN THE PRACTICAL SITUATION. THE W SCALE SCORE CAN BE INTERPRETED TO SUGGEST THE MINEMAN'S "KNOW-HOW" OVER AND ABOVE HIS COMPREHENSION OF ROUTINE MATTERS. FURTHER DISCUSSION OF THE TECHNICAL ASPECTS OF THIS SCORING AS WELL AS OTHER STATISTICAL CONSIDERATIONS RELEVANT TO THE RESEARCH WILL BE FOUND IN APPENDIX C, STATISTICAL DATA.

CONFIDENTIAL

CONFIDENTIAL

APPENDIX A

RAW DATA ON INDIVIDUAL MINEMEN BY
PAY GRADE

CONFIDENTIAL

CONFIDENTIAL

APPENDIX A

THIS APPENDIX MADE UP OF FOUR FOLD-OUT PAGES PRESENTS THE RAW DATA COLLECTED IN THIS STUDY. ON EACH OF THE FOUR PAGES THE COLUMN HEADINGS ARE THE SAME. FOLLOWING THE SUBJECT NUMBER ARE FOUR COLUMNS PRESENTING PERSONAL DATA.

Mos. SERVICE	NUMBER OF MONTHS IN THE NAVY.
Yrs. CIV. Sch.	NUMBER OF FULL SCHOOL YEARS COMPLETED.
GCT	GENERAL CLASSIFICATION TEST SCORE.
ELEM. COURSE GRADE	GRADE RECEIVED BY MINEMAN IN ELEMENTARY COURSE IN MINE WARFARE GIVEN AT U.S. NAVAL SCHOOLS, MINE WARFARE, YORKTOWN, VIRGINIA (1 AND 2 DID NOT TAKE THIS COURSE)

STATIONS 1 THROUGH 9

IN ORDER THESE ARE:

- 1 - BATTERY LOAD TEST
- 2 - M-11 SCHEMATIC READING
- 3 - CD-14 SETTING
- 4 - TUBE STRAP MANUFACTURE
- 5 - M-5 FIRING MECHANISM
- 6 - A-8 FIRING MECHANISM
- 7 - SOLDERING
- 8 - OPERATIONAL TEST MINE MK 36-1
- 9 - BUTTON-UP

TOTAL ALL STATIONS

THIS COLUMN PRESENTS A SIMPLE ADDITION OF THE MINE STATIONS.

F SCALE

DIAGNOSTIC SCALE - FACT

P SCALE

DIAGNOSTIC SCALE - PERFORMANCE

W SCALE

DIAGNOSTIC SCALE - WHY-WHEREFORE

MEANS AND STANDARD DEVIATIONS ARE PRESENTED AT THE FOOT OF EACH PAY GRADE COLUMN. IN COMPUTING STANDARD DEVIATIONS N-1 WAS USED FOR GROUPS CONTAINING LESS THAN 30 MEN.

CONFIDENTIAL

CONFIDENTIAL

RAW DATA ON INDIVIDUAL MINEMEN BY PAY GRADE

CHIEF PETTY OFFICERS

SUBJECT	Mos. SERVICE	Yrs. Civ. Sch.	GCT	ELEM. COURSE GRADE	1	2	STATION						TOTAL ALL STATIONS	SCALE		
							3	4	5	6	7	8	9	F	P	W
1	148	8	62	*	19	8	14	10	16	16	15	14	6	44	86	26
2	162	10	52	*	23	9	12	10	12	16	9	11	5	41	76	25
3	208	8	66	93	20	17	14	11	11	13	14	14	7	49	83	24
4	175	12	48	92	20	7	12	9	9	16	15	8	6	40	77	20
5	262	13	52	86	9	7	11	7	16	13	5	9	6	36	60	20
6	149	8	41	81	21	9	14	11	15	13	14	14	6	46	91	28
7	203	12	71	98	20	17	14	11	10	19	11	16	7	45	90	38
M	186.71	10.14	56.00	90.00	18.86	10.57	13.00	9.86	12.71	15.86	11.86	12.29	6.14	43.00	80.43	25.86
SD	40.93	2.19	10.66	6.595	4.53	4.47	1.29	1.46	2.93	2.27	3.76	2.93	.69	4.32	10.72	6.12

PETTY OFFICERS FIRST

SUBJECT	Mos. SERVICE	Yrs. Civ. Sch.	GCT	ELEM. COURSE GRADE	1	2	STATION						TOTAL ALL STATIONS	SCALE		
							3	4	5	6	7	8	9	F	P	W
8	76	11	48	77	27	12	9	9	13	16	9	14	7	39	86	32
9	168	12	55	79	23	5	8	6	18	14	14	12	7	41	81	20
10	119	12	68	78	21	13	10	10	10	8	8	8	6	38	67	24
11	147	12	67	92	28	16	14	11	11	15	10	15	5	51	88	35
12	74	12	43	88	14	11	12	10	13	16	14	8	7	41	78	25
13	66	10	58	86	22	16	12	10	11	16	12	11	6	48	81	29
14	54	12	63	91	10	14	8	10	13	14	12	15	5	36	74	30
M	100.57	11.57	57.42	84.43	20.7	12.4	10.4	9.43	12.71	14.14	11.29	11.86	6.14	42.00	79.28	27.86
SD	44.19	.79	9.47	6.35	6.58	3.78	2.3	1.62	2.63	2.85	2.36	3.02	.90	5.48	7.16	5.15

CONFIDENTIAL

CONFIDENTIAL

PETTY OFFICERS SECOND

SUBJECT	Mos. SERVICE	Yrs. CIV. SCH.	GCT	ELEM. COURSE GRADE	I	2	3	4	STATION				8	9	TOTAL ALL STATIONS	SCALE		
									5	6	7	8				F	P	W
15	40	13	54	87	19	5	9	10	8	13	10	12	5	5	91	32	66	18
16	38	12	57	85	25	4	9	9	7	13	14	8	7	7	96	35	76	12
17	39	14	65	87	23	6	10	8	7	15	14	14	4	4	101	36	74	21
18	43	12	70	89	13	5	5	8	11	11	13	11	7	7	84	23	65	19
19	116	11	49	79	19	5	5	7	11	11	13	10	4	4	85	29	63	22
20	39	12	65	84	17	5	7	9	8	3	15	6	4	4	79	38	58	12
21	41	10	56	92	19	10	11	10	12	13	14	11	6	6	106	38	77	24
22	37	12	66	85	15	9	9	4	12	10	10	8	5	5	82	35	56	20
23	123	10	59	75	16	5	9	2	10	7	8	5	7	7	69	27	49	11
24	116	12	52	76	16	8	4	8	12	10	6	7	6	6	77	30	62	13
25	44	10	54	83	15	10	10	2	7	12	16	8	7	7	87	30	63	24
26	39	12	57	88	20	5	7	6	14	15	2	9	5	5	83	28	65	10
27	38	12	58	91	22	5	11	10	9	6	9	9	6	6	87	33	65	16
28	54	12	71	96	18	13	11	11	15	16	13	11	4	4	118	44	86	31
M	57.64	11.71	59.50	85.58	18.36	7.14	8.4	7.64	11.64	12.07	9.71	8.36	5.50	5.50	88.93	32.71	66.07	18.07
SD	36.85	3.46	17.84	24.44	6.94	3.24	3.4	3.91	4.07	4.53	4.53	2.78	1.96	1.96	27.75	10.59	20.65	7.90

CONFIDENTIAL

CONFIDENTIAL

PETTY OFFICERS THIRD

SUBJECT	MOS. SERVICE	YRS. CIV. SCH.	QCT	ELEM. COURSE GRADE	S T A T I O N										TOTAL ALL STATIONS	S C A L E		
					1	2	3	4	5	6	7	8	9	F		P	W	
29	39	12	61	83	18	5	11	7	6	12	13	7	7	5	84	29	64	16
30	33	13	47	81	20	10	11	11	15	17	15	9	9	7	113	44	88	23
31	39	12	51	75	11	0	7	10	9	20	13	3	3	5	78	24	67	9
32	37	12	61	74	7	0	1	6	3	8	4	4	1	5	34	9	29	2
33	21	10	55	79	19	2	2	9	7	13	7	7	5	3	64	23	49	9
34	23	12	55	88	20	3	11	8	9	14	7	7	7	6	85	30	66	15
35	19	12	57	79	17	4	3	7	6	13	6	6	7	5	68	19	51	11
36	32	12	53	80	14	10	6	7	11	15	7	7	7	5	82	24	64	15
37	29	10	52	86	11	11	5	8	15	10	7	7	12	4	83	28	60	22
38	117	8	41	85	22	4	6	7	10	12	1	1	2	4	68	26	67	17
39	33	11	57	82	15	2	8	8	8	15	16	10	12	4	88	25	61	16
40	76	10	52	77	19	2	9	9	7	16	7	7	8	7	90	25	59	15
41	34	10	55	72	19	6	8	8	4	12	10	10	2	4	79	27	59	5
42	29	10	54	81	19	1	5	6	8	13	16	7	2	5	77	30	63	9
43	38	12	55	81	19	4	7	6	5	6	12	12	12	4	85	29	55	20
44	128	12	61	81	19	7	2	10	13	10	1	1	11	5	69	25	45	15
45	53	12	49	82	18	5	8	11	3	13	16	4	4	4	88	27	71	15
46	23	11	53	68	18	7	8	11	7	13	5	13	13	6	94	33	60	18
47	34	12	55	81	21	4	8	10	11	14	5	10	10	7	109	42	79	29
48	32	12	63	90	20	15	9	9	12	14	13	13	11	6	100	34	75	21
49	27	12	65	87	24	7	4	8	11	14	14	10	10	6	104	41	80	22
50	34	12	56	86	20	11	10	7	11	11	14	5	5	4	68	20	50	11
51	32	12	68	85	11	6	3	7	6	8	11	6	6	7	89	35	69	18
52	18	12	55	85	17	8	10	12	10	13	14	2	2	5	80	30	62	8
53	39	12	56	88	21	6	6	9	4	13	3	3	7	3	57	19	41	9
54	32	12	54	78	10	6	6	8	1	11	8	11	11	3	57	28	63	18
55	39	9	58	88	14	6	8	11	8	15	10	13	13	5	82	25	69	21
56	28	8	61	84	15	7	6	10	13	13	14	13	13	5	92	36	78	24
57	31	12	53	87	19	8	8	10	11	13	16	11	11	6	101	31	78	20
58	69	10	57	81	17	5	12	10	9	13	8	2	2	5	99	31	60	12
59	34	10	52	79	19	4	12	12	3	12	11	1	1	4	74	22	57	8
60	53	12	60	86	15	4	4	6	2	12	4	1	6	6	60	18	53	12
61	31	9	49	75	17	5	4	10	6	10	4	4	8	7	56	42	74	21
62	39	10	65	87	24	13	13	10	5	13	10	10	8	5	101	20	56	12
63	30	12	60	79	9	2	9	9	4	13	12	12	10	4	71	33	57	14
64	35	11	57	80	18	7	4	8	9	10	10	8	8	4	80	42	86	30
65	31	11	48	74	24	12	10	10	13	13	13	13	13	3	111	33	68	24
66	33	12	60	85	11	9	10	8	13	13	10	11	11	6	91	33		
M	39.58	11.13	55.82	81.55	17.13	6.00	7.47	8.71	8.00	12.61	9.87	7.68	5.03	28.74	82.26	62.71	15.82	
SD	22.65	1.25	5.32	5.02	4.18	3.51	3.18	1.66	3.66	2.62	4.33	3.83	1.12	7.47	16.55	12.15	6.23	

CONFIDENTIAL

CONFIDENTIAL

SEAMEN

SUBJECT	Mos. SERVICE	YRS. CIV. SCH.	GCT	ELEM. COURSE GRADE	STATION					TOTAL ALL STATIONS	SCALE				
					1	2	3	4	5	6	7	8	9	F	P
67	35	12	55	82	14	2	6	9	1	13	14	2	4	17	59
68	21	12	62	82	10	7	2	9	5	11	10	0	5	16	48
69	16	9	47	76	16	5	4	13	2	12	5	5	4	22	52
70	22	12	58	76	13	5	3	7	2	11	5	8	4	14	43
71	10	12	43	81	16	3	8	8	1	15	5	10	6	26	53
72	24	12	50	88	17	2	5	9	1	10	6	7	3	14	54
73	23	10	55	70	8	5	6	6	4	12	6	4	6	16	41
74	20	12	60	66	19	3	9	5	1	12	7	11	3	22	49
75	15	11	64	76	15	6	2	7	4	12	5	6	2	15	43
76	30	8	51	78	13	4	3	11	11	5	10	4	3	20	52
77	18	10	51	84	7	2	8	10	0	11	11	4	4	12	40
78	32	11	59	79	22	3	7	9	3	8	11	11	7	23	62
79	15	12	42	78	10	7	4	8	4	10	12	5	4	15	50
80	62	8	51	79	11	3	7	8	3	11	6	3	4	27	47
81	27	12	60	80	11	3	8	9	7	8	13	4	2	21	61
82	15	10	47	75	15	3	10	10	6	10	10	4	4	26	57
83	19	11	57	79	16	3	7	6	6	8	12	4	3	21	45
84	18	11	60	74	14	3	4	7	3	14	11	2	4	21	59
85	25	12	55	73	18	2	7	10	8	13	11	5	5	25	69
86	25	12	58	85	14	7	10	8	3	13	11	8	5	32	60
87	30	12	64	86	13	6	6	7	4	15	13	6	4	22	52
88	15	12	58	78	11	5	5	9	3	10	15	5	4	16	49
89	25	12	53	71	9	0	5	6	2	10	10	4	4	13	46
90	23	10	51	79	11	4	7	10	3	10	10	4	4	29	63
91	14	12	53	84	10	5	7	6	5	13	10	3	6	23	62
92	20	12	55	82	24	14	5	8	3	12	13	10	5	31	71
93	16	10	57	81	15	4	6	8	8	13	13	6	7	21	55
94	23	8	57	70	14	4	8	8	6	12	10	2	4	13	40
95	15	10	46	81	16	2	3	4	1	11	7	5	3	30	68
96	19	11	46	84	17	6	9	9	6	13	17	6	4	20	51
97	22	12	55	82	17	3	6	7	3	10	6	10	7	23	47
98	18	12	62	80	10	12	10	10	3	13	3	7	6	29	72
99	21	11	57	86	15	4	8	6	10	14	12	11	5	27	56
100	19	12	53	77	20	9	4	10	7	11	2	8	5	21	51
101	19	12	56	72	10	11	9	10	8	13	7	14	5	29	56
102	15	10	56	87	9	3	10	10	4	15	12	10	3	28	55
103	14	10	47	76	14	5	6	10	4	11	8	15	4	28	61
104	19	8	55	69	9	8	12	10	9	10	11	12	5	28	62
105	21	12	51	79	18	3	4	5	6	10	11	5	5	16	39
106	9	10	54	73	8	3	9	8	3	10	2	5	5	17	55
107	8	10	55	73	11	2	9	10	2	11	11	7	4	28	57
108	9	13	54	77	15	5	5	9	7	12	12	6	5	23	46
109	14	10	51	76	8	5	5	7	3	13	13	5	3	33	61
110	32	12	58	75	14	5	5	7	10	11	13	9	6	32	70
111	31	13	51	80	24	4	7	11	6	13	11	9	6	32	70
M	20.95	11.00	54.22	78.20	13.80	4.80	6.49	8.22	4.73	11.36	9.67	6.80	4.40	22.62	54.24
SD	8.53	1.33	4.18	5.04	4.12	2.89	2.34	1.80	2.90	2.16	3.47	3.35	1.24	5.81	8.55

CONFIDENTIAL

CONFIDENTIAL

APPENDIX B

SCORING FORMS AND ITEM INFORMATION

CONFIDENTIAL

CONFIDENTIAL

APPENDIX B

THIS APPENDIX CONTAINS A COPY OF THE SCORING FORM FOR EACH OF THE NINE STATIONS OF THE CRITERION MEASURE. IN ADDITION, CERTAIN SPECIFIC INFORMATION RELEVANT TO EACH STATION IS PROVIDED. BEFORE DISCUSSING EACH STATION THERE ARE SEVERAL THINGS WHICH MAY BE NOTED WITH RESPECT TO THE FORM AS A WHOLE.

THE NUMBERS AT THE BOTTOM OF EACH OF THE TEST FORM SHEETS DO NOT CORRESPOND TO THE PAGINATION OF THIS VOLUME. THEY WERE USED TO KEEP THE FORMS IN ORDER DURING CRITERION ADMINISTRATION. THE READER MAY ALSO IGNORE THE LETTERS AND ARROWS PRINTED IN THE UPPER RIGHT HAND CORNER OF EACH SCORING FORM; THESE WERE USED IN THE OPERATIONS OF DIAGNOSTIC SCORING.

THE DIRECTIONS AT THE END OF EACH OF THE STATION FORMS ARE REMINDERS FOR THE EXAMINER. WHERE POSSIBLE THE MINEMAN BEING EXAMINED WAS REQUESTED TO RETURN THE GEAR TO ITS ORIGINAL STATE AND THE EXAMINER WAS DIRECTED TO MAKE CERTAIN THAT THE STATION WAS READY FOR THE NEXT EXAMINEE.

IT WILL BE NOTICED THAT WHAT THE EXAMINERS IS TO DO OR SAY STARTS AT THE EXTREME LEFT HAND MARGIN OF THE SCORING FORM. ANYTHING SAID TO THE MINEMAN IS ENCLOSED IN A BOX. INDENTED ONE INCH FROM THE MARGIN ARE STATEMENTS WHICH IN THE TYPICAL CASE ARE ITEM CRITERIA OR DIRECTIONS FOR SCORING. EXPERIENCE SUGGESTED THAT THIS INFORMATION SHOULD APPEAR ON THE SCORING FORM RATHER THAN IN A SEPARATE EXAMINER'S HANDBOOK. IN ANY FUTURE REVISION THESE STATEMENT SHOULD BE EXPANDED RATHER THAN DELETED.

CONFIDENTIAL

CONFIDENTIAL

ON THE RIGHT HAND SIDE OF EACH PAGE OF THE SCORING FORM THE ITEMS ARE ARRANGED IN THE ORDER THAT MINEMEN ARE LIKELY TO COMPLETE THEM. THE SMALL CIRCLES OPPOSITE EACH ITEM INSURED THAT THE SIMPLE CHECK MARK, USED BY THE EXAMINERS, WOULD BE SO PLACED AS TO MAKE SCORING POSSIBLE USING AN OVERLAY KEY. THE EXAMINERS WERE DIRECTED TO PLACE A CHECK MARK IN THE CIRCLE TO INDICATE SUCCESSFUL COMPLETION OF THE ITEM. FAILURE WAS REPRESENTED BY A BLANK CIRCLE. THE FORM FOR EACH STATION WAS PRINTED ON PAPER OF A DIFFERENT COLOR. THIS MADE FOR QUICK AND EASY IDENTIFICATION DURING ADMINISTRATION AND SCORING.

THE MATERIAL FOLLOWS IS ORGANIZED IN A SIMILAR WAY FOR EACH STATION.

1. THE SCORING FORM ON COLORED PAPER.
2. SUPPLEMENTARY DIRECTIONS TO SUBJECTS.

THESE WERE TYPED ON CARDS AND WHERE POSSIBLE COVERED WITH ACETATE AND TAPED DOWN. IT SHOULD BE NOTED THAT ALL DIRECTIONS ORDINARILY FOUND IN TEST SETS WERE REMOVED.

3. ITEM CHARACTERISTICS.

THREE CHARACTERISTICS ARE PRESENTED FOR EACH ITEM:

- A) THE DIAGNOSTIC SCALE OR SCALES INTO WHICH IT WAS CODED.
- B) THE PERCENT OF SUCCESS WHICH GIVES AN INDEX OF ITS DIFFICULTY FOR THE 111 MINEMEN.
- C) THE CORRELATION OF EACH ITEM WITH THE TOTAL SCORE. THIS GIVES AN INDEX OF THE DISCRIMINATION LEVEL OF EACH ITEM. A DOUBLE ASTERISK (**) IS ASSOCIATED WITH CORRELATIONS SIGNIFICANT AT THE .01 LEVEL AND A SINGLE ASTERISK (*) WITH THOSE AT THE .05 LEVEL. THE CORRELATIONS WERE DETERMINED USING THE PROCEDURES OUTLINED IN APPENDIX B OF THORNDIKE'S "PERSONNEL SELECTION".¹

4. THE AVERAGE DIFFICULTY LEVEL OF EACH STATION IS PRESENTED BOTH

¹THORNDIKE, R.L. - PERSONNEL SELECTION, NEW YORK, JOHN WILEY & SONS, 1949.

CONFIDENTIAL

CONFIDENTIAL

AS A PERCENT AND IN ITS RANK ORDER. THE RANK OF ONE WAS GIVEN TO THE MOST DIFFICULT STATION AND NINE TO THE EASIEST.

5. SUGGESTED CHANGES.

IN THIS SECTION ERRORS IN THE FORMS ARE NOTED AND SUGGESTIONS ARE MADE FOR FUTURE REVISIONS. DECISIONS BASED ON THESE SUGGESTIONS ARE BASED ON THE ITEM ANALYSIS DATA WHICH INVOLVES BOTH THE DIFFICULTY AND DISCRIMINATING POWER OF AN ITEM. THE DISCRIMINATION IS BASED ON A CORRELATION WITH THE TOTAL SCORE; IT MAY BE THAT AN ITEM IS USEFUL EVEN THOUGH IT BEARS NO RELATION TO THAT SCORE.

6. EQUIPMENT LISTS.

ALL GEAR NECESSARY TO ADMINISTER THE STATION IS LISTED. SPARE COMPONENTS ARE NOT INCLUDED SINCE THE NUMBER NECESSARY WILL DEPEND ON THE SIZE OF THE PROGRAM. IN GENERAL, EASILY AVAILABLE GEAR WHICH REQUIRES MODIFICATION IN ADVANCE OF USE SHOULD BE ADDED IN EXTRA QUANTITIES.

7. COMPONENT MODIFICATION.

FOR THOSE STATIONS WHERE MODIFICATIONS WERE MADE ON COMPONENTS A DESCRIPTION OF THE CHANGE IS GIVEN. THIS SECTION ALSO INCLUDES SUCH THINGS AS THE POSITION OF TEST SET SWITCHES AT THE START OF STATION ADMINISTRATION.

CONFIDENTIAL

A
↓

CONFIDENTIAL

BATTERY LOAD TEST

POINT TO THE FIRING MECHANISM.

WHAT IS THIS?

NO CREDIT FOR "FIRING MECHANISM".
IF MARK OR MOD NO. NOT MENTIONED ASK:

1) A-5 FIRING MECH.

☐

WHAT MARK? WHAT MOD?

2) MOD 2

☐

POINT TO THE TEST SET.

WHAT IS THIS?

NO CREDIT FOR "TEST SET".
IF MARK OR MOD NO. NOT MENTIONED ASK:

3) MK 61 TEST SET

☐

WHAT MARK? WHAT MOD?

4) MOD 1

☐

POINT TO THE BATTERY.

WHAT IS THIS?

ACCEPT EITHER BA 241/U OR B-21.

5) BA 241/U (B-21)

☐

IN WHAT YEAR WAS IT MANUFACTURED?

LAST DIGIT OF THREE INDICATES
YEAR OF MANUFACTURE.

6) REPORTS CORRECT
YEAR

☐

WHICH COMPONENTS ON THE TABLE ARE NECESSARY TO MAKE
A LOAD TEST ON THIS BATTERY?

7) INCLUDES A-5
MECHANISM

☐

CONFIDENTIAL

B
↓

CONFIDENTIAL

YOU ARE TO MAKE A LOAD TEST ON THIS BATTERY USING
THE A-5 MECHANISM

POINT TO CARD NO. 1 AND SAY:

FOLLOW THESE DIRECTIONS

ITEMS 7 THROUGH 21 ARE SCORED AS THEY ARE DONE.
SEQUENCE IS NOT IMPORTANT. DO NOT GIVE CREDIT FOR
ANY ITEM COMPLETED AFTER THE MN HAS INDICATED HE
IS READY TO TEST.

NO CREDIT IF ANY ONE SWITCH IS NOT IN
PROPER POSITION.

- 8) SWITCH SETTINGS
CORRECT ☐
- 9) BATTERY AMPHENOL
PLUG VISUAL ☐
- 10) ELBOW AMPHENOL
PLUG VISUAL ☐
- 11) STER AMPHENOL PLUG
VISUAL ☐
- 12) INPUT AMPHENOL PLUG
VISUAL ☐
- 13) MECH AMPHENOL PLUG
VISUAL ☐
- 14) MECH AMPHENOL PLUG
SCREW ☐
- 15) CONNECTS TEST SET
TO 110 VOLTS ☐
- 16) INSERTS SIX-PRONG
JUMPER ☐

CONFIDENTIAL

CONFIDENTIAL

C
↓

- 17) SETS SE-3 ON 1 ☐
- 18) CONNECTS WIRE TO
TERMINAL A ☐
- 19) DOES NOT MAKE
UNNECESSARY CON-
NECTIONS ☐
- 20) CHECKS PRESENCE
OF FIRING CON-
DENSER ☐
- 21) ZEROS METER ☐

WHEN MN INDICATES THAT HE IS READY TO TEST,
FINISH SCORING ITEMS 7 THROUGH 21 AND COMPLETE
ANY TASK HE HAS NOT DONE OR HAS DONE INCORRECTLY.

POINT TO THE LETTERS VTVM ON THE TEST SET PANEL.

WHAT DO THESE LETTERS MEAN?

NO CREDIT FOR "VOLTMETER".

POINT TO LETTERS ACH ON THE TEST SET PANEL.

WHAT DO THESE LETTERS MEAN?

POINT TO CARD NO. 2 AND SAY:

PROCEED WITH THE LOAD TEST, FOLLOW THESE DIRECTIONS

- 22) VACUUM TUBE VOLT-
METER ☐
- 23) A-C HEATER ☐
- 24) 1.5 READING MADE
"HEAD-ON" ☐

CONFIDENTIAL

CONFIDENTIAL

D
↓

25) 22.5 READING MADE
"HEAD-ON" ☐

26) 40.5 READING MADE
"HEAD-ON" ☐

27) 60 READING MADE
"HEAD-ON" ☐

IGNORE MANNER OF METER READING
BEYOND 60. MN SHOULD TURN SELECTOR
SWITCH FORWARD OR BACKWARD TO CHECK
ITS OPERATION OR TO INSURE PROPER
POSITIONING WHEN HE OBTAINS THE
READING BELOW SCALE AT THE 60 SET-
TING.

28) CHECKS SELECTOR
SWITCH SETTING ☐

MN SHOULD THROW BATT-BIAS SWITCH
TO BIAS MOMENTARILY TO CHECK
-1.5 VOLT C SECTION. IGNORE
MANNER OF READING.

29) CHECKS -1.5 C
SECTION ☐

IF MN DOES NOT RETURN BATT-BIAS TO BATT IMMEDI-
ATELY AFTER READING, RETURN IT FOR HIM.

30) RETURNS BATT-BIAS
TO BATT ☐

WHEN MN INDICATES THAT HE HAS FINISHED THE LOAD
TEST ASK HIM:

SHOULD THIS BATTERY BE ACCEPTED OR REJECTED?

NO CREDIT IF NOT REJECTED FOR
60 SETTING.

31) REJECTS BATTERY ☐

TELL THE MN TO DISCONNECT THE CABLES, WHILE HE
DOES THIS: REMOVE THE 6 PRONG JUMPER
SET SE-3 ON 2
DISCONNECT TERMINAL A OF SE-3
DISCONNECT TEST SET FROM 110 VOLTS
PLACE CA-569 IN TEST SET
TURN METER NEEDLE OFF ZERO.

CONFIDENTIAL

CONFIDENTIAL

BATTERY LOAD TEST - STATION 1

CARD NUMBER 1, REFERRED TO BETWEEN ITEMS 7 AND 8 IS REPRODUCED BELOW:

CARD No. 1

SET THE TEST SET CONTROLS AS FOLLOWS:

BATT-BIAS SWITCH ON BATT

BATT-VTVM SWITCH ON BATT

FIL ON-OFF-ACH SWITCH ON FIL ON

HV OFF-ON SWITCH ON HV OFF

BE OFF-BE ON SWITCH ON BE ON

ENERGY-ON SWITCH ON ENERGY

TRANS-OFF-ELEC SWITCH ON OFF

BATTERY TEST SELECTOR ON OFF

NOW FINISH PREPARING THE TEST SET AND THE A-5 MECHANISM FOR THE LOAD TEST ON THE B-21 (BA 241/U) BATTERY BY CONNECTING THE CABLES AND SETTING THE SE-3 ON 1.

MAKE A VISUAL CHECK OF BOTH THE TEST SET AND THE A-5 MECHANISM AND MAKE ANY CHANGES NECESSARY TO PREPARE THEM FOR THE LOAD TEST. TELL THE EXAMINER WHEN YOU ARE READY TO TEST.

CARD NUMBER 2, MENTIONED FOLLOWING ITEM 23 CONTAINED THE FOLLOWING DIRECTIONS:

CONFIDENTIAL

CONFIDENTIAL

CARD NO. 2

PROCEED WITH THE LOAD TEST BY READING THE VOLTAGE INDICATOR METER WITH THE BATTERY TEST SELECTOR AT EACH OF THE 12 SWITCH POSITIONS EXCEPT THOSE LABELED ENER AND 6 BATT SUPPLY. THE METER SHOULD READ BETWEEN 72 AND 88 AT EACH POSITION. BE SURE TO CHECK THE -1.5 VOLT C SECTION OF THE BATTERY. DO EVERYTHING TO INSURE THAT A PROPER TEST IS CARRIED OUT BEFORE TELLING THE EXAMINER YOU ARE FINISHED.

ITEM CHARACTERISTICS

BATTERY LOAD TEST
STATION I

ITEM	DIAGNOSTIC SCALE	PERCENT SUCCESS	CORRELATION WITH TOTAL SCORE
1	F	78	.70**
2	F	57	.48**
3	F	42	.31*
4	F	32	.34**
5	F	42	.38**
6	FW	50	.35**
7	FW	23	.37**
8	P	78	-.04

CONFIDENTIAL

CONFIDENTIAL

ITEM	DIAGNOSTIC SCALE	PERCENT SUCCESS	CORRELATION WITH TOTAL SCORE
9	P	77	.10
10	P	73	.09
11	P	87	.13
12	P	85	.07
13	P	68	.27*
14	P	80	.30*
15	P	58	.31*
16	FPW	67	.45**
17	P	35	.63**
18	FP	42	.51**
19	FP	47	.07
20	FP	27	.42**
21	PW	0	.00
22	FW	42	.57**
23	F	18	.60**
24	P	77	.28*
25	P	77	.17
26	P	75	.32
27	P	73	.26
28	PW	45	.04

CONFIDENTIAL

CONFIDENTIAL

ITEM	DIAGNOSTIC SCALE	PERCENT SUCCESS	CORRELATION WITH TOTAL SCORE
29	FP	10	.14
30	FP	08	.08
31	F	70	.30*

AVERAGE DIFFICULTY 52%
RANK ORDER 5

SUGGESTED CHANGES

ITEMS 8 THROUGH 12 AND PERHAPS 14 AND 15 AS WELL SHOULD BE DELETED FROM FUTURE FORMS. AS CAN BE SEEN IN THE RIGHT HAND COLUMN OF THE DATA PRESENTED ABOVE THEY DISCRIMINATE POORLY, A FACT WHICH IS RELATED TO THEIR EASE OF COMPLETION. IF THEY ARE DELETED THE COMPONENTS SHOULD BE CONNECTED BEFORE THE MINEMAN STARTS WORK.

ITEM 18 WHICH PASSED INSPECTION THROUGH ALL STAGES INCLUDING THE FINAL SCORING ACTUALLY REQUIRED AN UNNECESSARY CONNECTION TO BE MADE, SURPRISINGLY, THE ANALYSIS SHOWED IT TO BE A DISCRIMINATING ITEM. ITEM 19 IS TECHNICALLY SOUND BUT SHOULD BE DROPPED FOR LACK OF DISCRIMINATION.

NONE OF THE 111 MINEMEN ZEROED THE METER FROM WHICH THE CRITICAL READINGS WERE TO BE MADE. THE METER WAS SET OFF ZERO PREVIOUS TO EACH EVALUATION. THE EXTREME DIFFICULTY OF ITEM 21 IS PROBABLY DUE TO THE FACT THAT THE TEST SET PROVIDES FOR TWO METHODS OF ZEROING, ONE ELECTRICAL AND ONE MANUAL. SOME MINEMEN ATTEMPTED TO ZERO ELECTRICALLY THE METER, A

CONFIDENTIAL

CONFIDENTIAL

PROCEDURE WHICH GAVE NO RESULT SINCE THE METER HAD BEEN MANUALLY SET.

THIS ITEM SHOULD BE RETAINED IN THE STATION BY REVISING THE DIRECTIONS TO THE SUBJECT.

ITEMS 24 THROUGH 27 ARE TOO EASY AND NON-DISCRIMINATING. ITEMS 29 AND 30 WHICH ARE TOO DIFFICULT IN THE PRESENT FORM CAN AND SHOULD BE SALVAGED IN FUTURE REVISIONS. ONE SUGGESTION WOULD BE TO USE THE WORD NEGATIVE IN PLACE OF THE MINUS SIGN ON CARD 2.

THIS STATION IN REVISED FORM WOULD REQUIRE A SOMEWHAT SHORTER TIME TO ADMINISTER SINCE CONSIDERABLE TIME WAS SPENT BY MOST SUBJECTS IN DECIDING WHERE EACH AMPHENOL PLUG WAS TO BE CONNECTED.

EQUIPMENT LIST

- A) FIRING MECHANISM A-5 MOD 2
- B) TEST SET Mk 61 MOD 1 (INCLUDING 6-PRONG JUMPER)
- C) BA 241/U (B-21) BATTERY
- D) SCREWDRIVER, 3 INCH
- E) BA-239/U (B-17) BATTERY
- F) 150,000 OHM POTENTIOMETER

COMPONENT MODIFICATION

FIRING MECHANISM A-5 MOD 2

- A) NOMENCLATURE COVERED WITH MASKING TAPE
- B) SE-3 SET ON 2 AND WIRED TO PREVENT BLOWING FUSES
- C) WIRE TO TERMINAL A OF SE-3 DISCONNECTED

TEST SET Mk 61 MOD 1

- A) NOMENCLATURE COVERED WITH MASKING TAPE
- B) SWITCH SETTINGS AT START OF EACH EVALUATION:

CONFIDENTIAL

CONFIDENTIAL

BATT-BIAS on BIAS
BATT-VTVM on VTVM
FIL ON-OFF-ACH on OFF
HV OFF-ON on HV OFF
BE OFF-BE ON on BE OFF
ENERGY-ON on ENERGY
TRANS-OFF-ELEC on TRANS
BATTERY SELECTOR on 22.5

- C) 6-PRONG JUMPER ON TABLE IN FRONT OF FIRING MECHANISM
- D) VOLTAGE INDICATOR METER MECHANICALLY SET OFF ZERO AGAINST THE PEG TO THE LEFT
- E) WIRING MODIFIED SO THAT A READING OF 70 IS OBTAINED AT 60.0 SELECTOR SWITCH POSITION. AN ADJUSTABLE (150,000 OHM POTENTIOMETER IN SERIES) DC VOLTAGE FROM A B-17 (BA-239/U) BATTERY IS IMPRESSED ON THE METER WITH THE SWITCH SO SET

BA 241/U BATTERY

- A) NOMENCLATURE, BUT NOT DATE CODE, COVERED WITH MASKING TAPE
- B) LEAD FROM 60 VOLT SECTION REMOVED FROM PIN OF AMPHENOL PLUG AND TAPED, AMPHENOL REASSEMBLED

CONFIDENTIAL

J
↓

CONFIDENTIAL

M-11 SCHEMATIC READING

THIS IS A SCHEMATIC DIAGRAM OF THE M-11 FIRING MECHANISM, YOU ARE TO USE IT AT THIS STATION. FIRST I WILL ASK YOU SOME QUESTIONS BASED ON IT.

POINT TO DETONATOR AND ASK:

WHAT IS THIS?

1) DETONATOR



POINT TO R128 AND ASK:

WHAT IS THE VALUE OF R128 IN OHMS?

IF MN GIVES AN ANSWER IN ANY OTHER UNITS ASK HIM:
HOW MANY OHMS?

2) 1000 OHMS



HAND POINTER TO MN AND TELL HIM:

POINT TO A POTENTIOMETER.

3) R107 OR R138



POINT TO THE BLACK DOT IN G-7 TUBE AND ASK MN:

WHAT DOES THIS BLACK DOT MEAN?

4) GAS FILLED TUBE



POINT TO THE VARISTOR AND ASK:

WHAT IS THIS?

5) VARISTOR



NO CREDIT FOR "TRANSISTOR"

CONFIDENTIAL

CONFIDENTIAL

K
↓

IF THE COMPONENTS WERE CONNECTED ON A BREADBOARD AS THEY ARE ON THE SCHEMATIC WHERE WOULD YOU PROBE WITH VOLTMETER LEADS TO GET OVER 230 VOLTS?

ACCEPT ANY EQUIVALENT POINTS

6) E AND D

USE THE POINTER TO SHOW THE DIRECTION IN WHICH THE CURRENT FLOWS THROUGH THE DETONATOR.

IF MN FAIL TO IDENTIFY THE DETONATOR IN ITEM 1 POINT TO IT AND SAY: HERE IS THE DETONATOR THEN GIVE THE DIRECTIONS ABOVE.

7) BOTTOM TO TOP

POINT TO R138 AND INDICATE MOVING THE ARM TO THE LEFT OF THE DIAGRAM AS YOU ASK:

IF THE MOVEABLE ARM OF R138 IS MOVED TOWARD THE LEFT OF THE DIAGRAM WHAT WOULD THE EFFECT BE ON THE MECHANISM?

ACCEPT EQUIVALENT STATEMENTS SUCH AS:
LESS INDUCED CURRENT REQUIRED TO FIRE,
WEAKER SIGNAL REQUIRED TO FIRE.

8) MAKE IT MORE SENSITIVE

POINT TO G-3 AND G-5 TUBES IN TURN AS YOU ASK:

THIS TUBE (G-3) AND THIS TUBE (G-5) HAVE FIRED AS A RESULT OF THE FIRST LOOK, POINT TO THE TUBES IN ORDER IN WHICH THEY FIRE WHEN THE MECHANISM IS GIVEN THE SECOND LOOK.

IF MN POINTS TO G-9 BETWEEN G-4 AND G-6 ALLOW CREDIT FOR THIS ITEM.
GIVE CREDIT EVEN IF G-9 IS NOT MENTIONED.

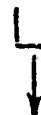
9) G-2-4-6-7

WHAT TUBE, WHEN IT FIRES, DROPS THE VOLTAGE TO G-2 AND G-3?

10) G-9 TUBE

CONFIDENTIAL

CONFIDENTIAL



HAND MN 3 RESISTORS, POINT TO COLOR CODE, AND SAY:

USE THIS CODE TO DETERMINE THE VALUE OF THESE RESISTORS

11) 200,000 OHM



12) 680,000 OHM



13) 10,000,000 OHM



PLACE THE 3 RESISTORS AND A SECOND 10,000,000 OHM RESISTOR ON BREADBOARD A AND SAY:

USING ANY OF THE COMPONENTS ON THE BOARD HOOK UP THE PART OF THE M-11 CIRCUIT WHICH IS INDICATED IN RED

IGNORE RESISTOR VALUE, WATCH MN SO AS TO PREVENT HIM FROM CONNECTING BATTERY IF CIRCUIT IS INCORRECT.

14) CIRCUIT CORRECT



15) USES BOTH 10,000,000 OHM RESISTORS



POINT TO BREADBOARD B AND SAY:

WHERE WOULD YOU PROBE WITH VOLTMETER LEADS TO GET APPROXIMATELY 95 VOLTS?

16) INDICATE PLACING LEADS ACROSS THE LARGER RESISTOR



HAND MN THE MILLIAMMETER AND SAY:

CONNECT THIS METER SO AS TO SHOW THE CURRENT FLOWING IN THE CIRCUIT

17) METER IN SERIES



IF MN SUCCESSFULLY COMPLETES ITEMS 15, 16, AND 17, PLACE A 10,000,000 OHM RESISTOR ON BREADBOARD C AND SAY:

CONNECT THE COMPONENTS ON THE BOARD TO MAKE A SIMPLE OSCILLATOR CIRCUIT. THE OSCILLATIONS ARE TO BE SHOWN BY THE LAMP FLASHING. YOU HAVE FIVE MINUTES

18) LAMP FLASHES



CONFIDENTIAL

CONFIDENTIAL

M-II SCHEMATIC READING - STATION 2

THIS COLOR CODE WAS GIVEN TO THE SUBJECT:

RESISTOR COLOR CODE

BLACK	0
BROWN	1
RED	2
ORANGE.	3
YELLOW.	4
GREEN	5
BLUE.	6
VIOLET.	7
GRAY.	8
WHITE	9

THIRD COLOR MULTIPLIER

GOLD AND SILVER TOLERANCE

ITEM CHARACTERISTICS

M-II SCHEMATIC READING
STATION 2

ITEM	DIAGNOSTIC SCALE	PERCENT SUCCESS	CORRELATION WITH TOTAL SCORE
1	F	70	.68**
2	F	27	.65**

CONFIDENTIAL

CONFIDENTIAL

ITEM	DIAGNOSTIC SCALE	PERCENT SUCCESS	CORRELATION WITH TOTAL SCORE
3	F	67	.80**
4	F	67	.46**
5	F	17	.50**
6	W	40	.28*
7	FW	35	.11
8	FW	43	.28*
9	FW	55	.45**
10	FW	38	.32*
11	PW	28	.66**
12	PW	25	.63**
13	PW	27	.53**
14	PW	20	.41**
15	PW	23	.60**
16	FW	45	.25
17	F	57	.34**
18	FPW	17	.65**

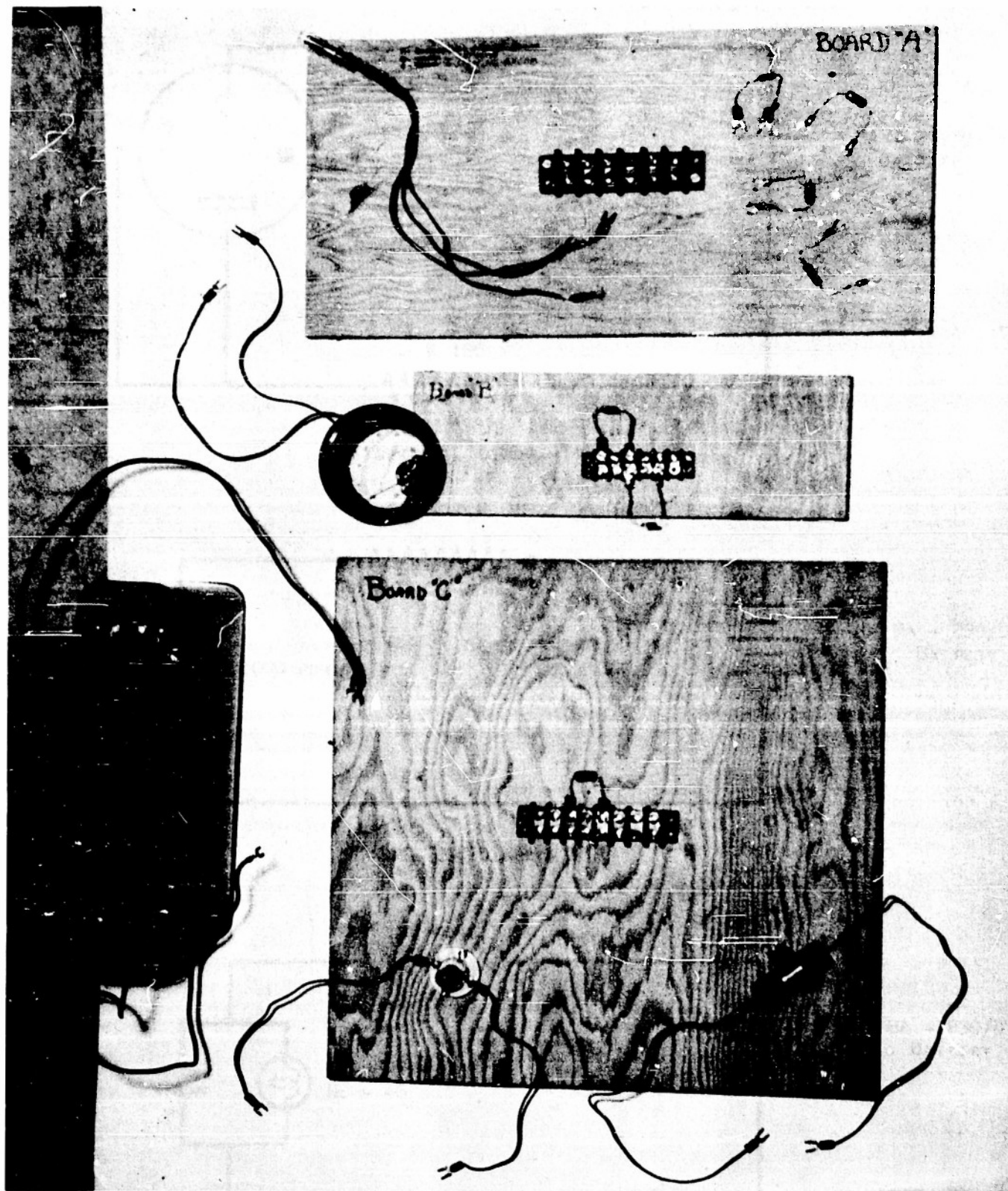
AVERAGE DIFFICULTY 35%
RANK ORDER 1
(MOST DIFFICULT)

SUGGESTED CHANGES

THE ONLY SUGGESTED REVISION OF THIS STATION WOULD BE TO CLARIFY THE

CONFIDENTIAL

CONFIDENTIAL



BREADBOARDS EMPLOYED AT STATION 2

FIGURE 12.

CONFIDENTIAL

CONFIDENTIAL

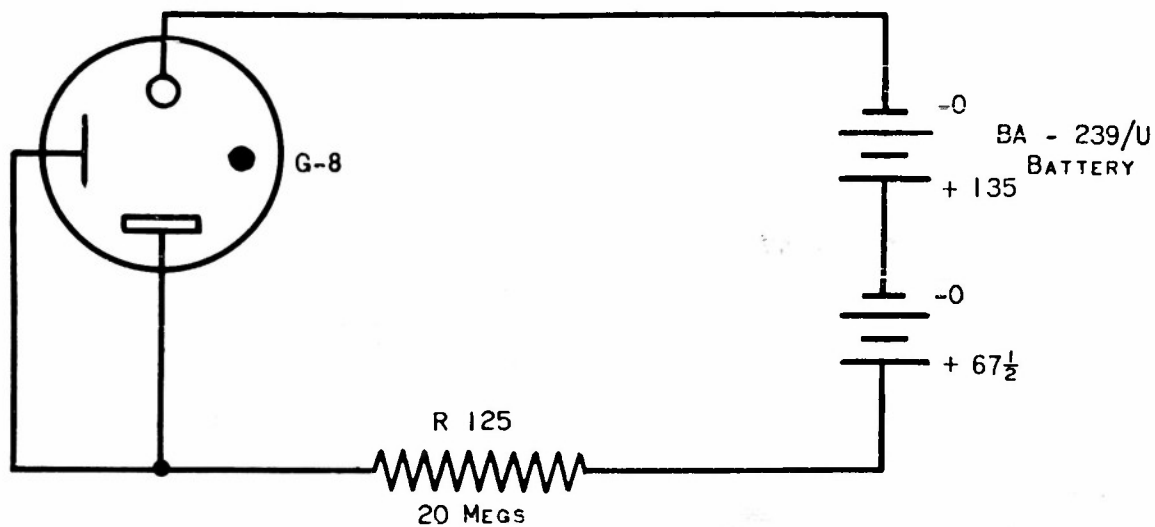


FIGURE 13A DIAGRAM A

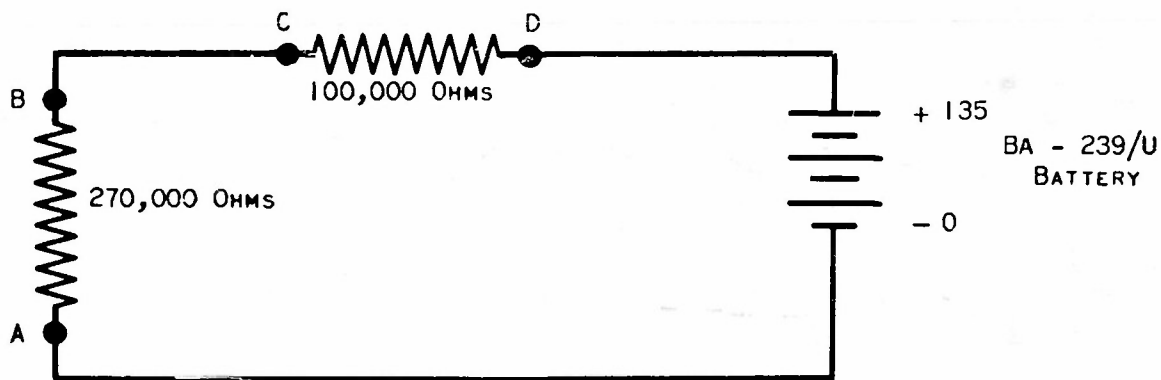


FIGURE 13B DIAGRAM B

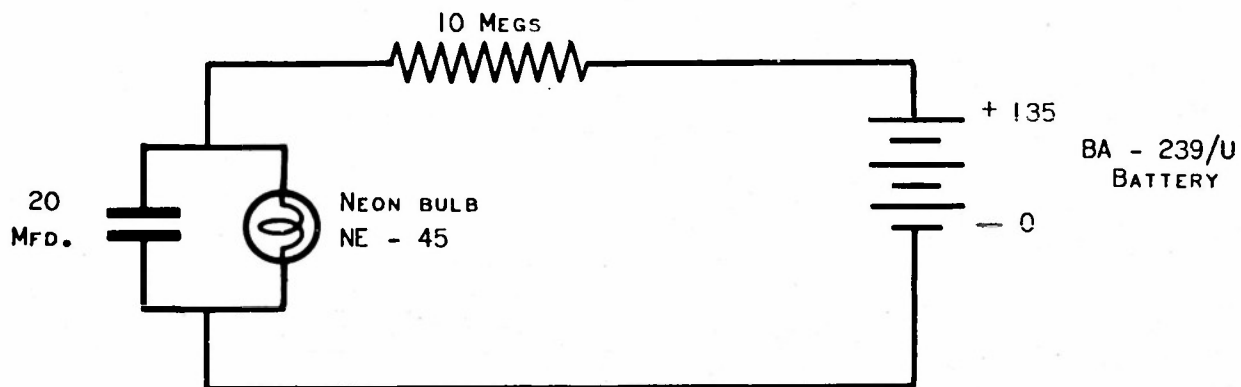


FIGURE 13C DIAGRAM C

CONFIDENTIAL

CONFIDENTIAL

DIRECTION ASSOCIATES WITH ITEM 7. SOME CONFUSION EXISTED BETWEEN CURRENT FLOW AND ELECTRON FLOW WHICH PROBABLY RESULTED IN THE POOR SHOWING MADE BY THIS ITEM.

EQUIPMENT LIST

- A) POINTERS (FOR SCHEMATIC TRACING)
- B) FIGURE 3, GP 681, (CHANGE 1) PREFERABLY A PHOTOSTAT ENLARGEMENT 17 BY 20 INCHES COVERED WITH CLEAR ACETATE
- C) THREE BREADBOARDS AS PICTURED IN FIGURES 12 AND 13

COMPONENT MODIFICATION

THE THREE BREADBOARDS MENTIONED ABOVE WERE SET UP AS ILLUSTRATED IN THE PICTURE ON PAGE 95. THIS PICTURE SHOWS THE BOARDS AS THEY WERE PRESENTED TO THE SUBJECTS.

BREADBOARD A IS SHOWN CORRECTLY CONNECTED IN SCHEMATIC FORM IN FIGURE 13A. IT WAS NECESSARY FOR THE SUBJECT TO USE TWO 10 MEG RESISTORS TO GET 30 MEGS.

BREADBOARD B IS SHOWN IN SCHEMATIC FORM IN FIGURE 13B. ITEM 16 WAS SCORED CORRECT IF MINEMAN INDICATED HE WOULD PLACE THE VOLTMETER LEADS AT POINTS A AND B. ITEM 17 REQUIRED THAT THE CIRCUIT BE BROKEN ANYWHERE AND THE MILLIAMETER CONNECTED IN SERIES.

BREADBOARD C FIGURE 13C SHOWS ONE OF TWO CORRECT HOOK-UPS FOR ITEM 18. AN ALTERNATIVE IS TO USE THE SAME CONNECTIONS BUT INTERCHANGE THE RESISTOR AND THE NEON BULB.

CONFIDENTIAL

CONFIDENTIAL

CD-14 SETTING

POINT TO THE CARD AND TO THE CALENDAR WHEN YOU MENTION IT, SAY:

FOLLOW THESE DIRECTIONS. YOU MAY USE THIS CALENDAR

NO CREDIT IF HOLE IN SETTING TOOL IS PLACED ON A PIN.

1) DOES NOT USE SETTING TOOL BEFORE REMOVING DIAL

☐

NO CREDIT IF ATTEMPT IS MADE TO SET WITHOUT REMOVING DIAL.

2) REMOVES DIAL ASSEMBLY

☐

3) USES 6 INCH SCREW-DRIVER

☐

NO CREDIT IF CENTER KNURLED NUT IS LOOSEMED TWICE.

4) SETS DA BEFORE S

☐

NO CREDIT IF ONLY ONE NUT IS TIGHTENED.

5) TIGHTENS BOTH KNURLED NUTS

☐

GIVE CREDIT FOR ITEM 4 IF DONE AS A RESULT OF THIS CHECK. NO CREDIT FOR ITEM 5 IF TIGHTENING IS NECESSARY AND CHECK IS NOT REPEATED.

6) ATTEMPTS TO MOVE CAMS TO CHECK TIGHTNESS OF SETTINGS

☐

7) COCKS CAM FOLLOWERS IN UNOPERATED POSITION

☐

NO CREDIT IF DIAL ASSEMBLY IS NOT "JIGGLED" TO CAREFULLY MESH GEARS. CREDIT FOR THIS ITEM GIVEN EVEN IF ZERO INDEX IS IGNORED.

8) "JIGGLES" WHILE TIGHTENING CENTER SCREW

☐

CONFIDENTIAL

S
↓

CONFIDENTIAL

T
↓

9) DA ON 13-15-17



10) S ON 90-95-98



11) ZERO ON ZERO INDEX



TAKE CLOCK FROM MN AND HAND HIM THE SCHEMATIC
DIAGRAM. SAY:

STUDY THIS SCHEMATIC DIAGRAM

WHILE MN IS STUDYING THE SCHEMATIC, SCORE THE
CLOCK SETTINGS, AND RESET THE CLOCK FOR THE NEXT
MN. WHEN YOU HAVE DONE THIS SAY TO THE MN:

I AM GOING TO ASK YOU SOME QUESTIONS, ANSWER THEM
USING THE SCHEMATIC DIAGRAM

WHY ARE THERE TWO CD-14 MOD 2 MECHANISMS?

CREDIT FOR ANY ANSWER WHICH IS EQUIVA-
LENT TO INSURANCE AGAINST FAILURE TO
ARM AND STERILIZE (NEED NOT USE WORDS
ARM AND STERILIZE).

12) INSURANCE



HAND MN A POINTER.

WHAT BATTERIES RUN THE CD-14 MOD 2 MOTORS?

CREDIT FOR INDICATION BY POINTING.

13) BA 205/U's



WHAT SWITCH THAT IS NOW OPEN ON THE SCHEMATIC MUST
BE CLOSED BEFORE THE CD-14 MOD 2 MOTORS CAN RUN?

CONFIDENTIAL

CONFIDENTIAL

CREDIT FOR "B" SWITCH OF CD-8 OR
INDICATION BY POINTING.

WHAT HAPPENS WHEN THE S-1 SWITCH OF A CD-14 MOD 2
OPENS?

14) 120 MINUTE SWITCH
OF CD-8

15) OPENS OR BREAKS
DETONATOR CIRCUIT



CONFIDENTIAL

CONFIDENTIAL

CD-14 SETTING - STATION 3

IN ADDITION TO THE CALENDAR SHOWN IN FIGURE 3 THE EXAMINEE WAS PRESENTED WITH A CARD CONTAINING THE FOLLOWING INFORMATION:

YOU ARE TO SET THE CD-14 WHICH IS ON THE TABLE ON THE BASIS OF THE FOLLOWING INFORMATION:

TODAY IS (DATE OF STATION ADMINISTRATION)
DAY MONTH YEAR

THE MECHANISM IS ONE OF TWO WHICH WILL BE INSTALLED IN A MINE Mk 25 MOD 0 TO BE PLANTED BY

AIRCRAFT ON (TODAY PLUS 5)
DAY MONTH YEAR

IN SEA WATER OF 65 DEGREES F. AT A DEPTH OF 75 FEET. PREPARE THE CD-14 SO THAT THE MINE

WILL BE ARMED FROM (TODAY PLUS 18)
DAY MONTH YEAR

TO (TODAY PLUS 95)
DAY MONTH YEAR

THE DETONATOR WILL BE INSTALLED IN THE MINE ON

(TODAY PLUS 4)
DAY MONTH YEAR

WHEN YOU HAVE FINISHED SETTING THE CD-14 REPLACE THE COVER BUT DO NOT SECURE IT.

THE CARD WAS TAPED TO THE BENCH UNDER CLEAR ACETATE AND A GREASE PENCIL WAS USED TO FILL THE BLANKS IN WITH APPROPRIATE DATES.

CONFIDENTIAL

CONFIDENTIAL

ITEM CHARACTERISTICS

CD-14 SETTING
STATION 3

ITEM	DIAGNOSTIC SCALE	PERCENT SUCCESS	CORRELATION WITH TOTAL SCORE
1	W	65	-.04
2	P	65	.40**
3	FP	23	.14
4	FP	78	.33**
5	P	82	.53**
6	P	10	.54**
7	FP	55	.70**
8	FP	53	.40**
9	PW	45	.25
10	PW	18	.37**
11	P	70	.48**
12	FW	50	.65**
13	P	73	.52**
14	P	67	.45**
15	P	23	.46**

AVERAGE DIFFICULTY 51%
RANK ORDER 4

CONFIDENTIAL

CONFIDENTIAL

SUGGESTED CHANGES

DELETE ITEM 1. THIS STATION, CONSIDERED AS ONE OF THE EASIER ONES, WAS USED AS A FIRST STATION FOR SOME MEN. THE "NEWNESS" OF THE STATION PROBABLY RESULTED IN SOME NERVOUSNESS AND A CONSEQUENT RANDOMNESS OF "STARTING" BEHAVIOR. ITEM 3 INVOLVED THE SELECTION OF A SCREWDRIVER THAT WOULD BEST FIT THE SLOT IN THE DIAL ASSEMBLY FROM THREE PRESENTED TO THE MINEMAN. THAT THE ITEM WAS NOT A DISCRIMINATING ONE IS PROBABLY DUE TO THE LACK OF DIRECTIONS OR "SET" TO SELECT PROPER TOOLS. THE ITEM SHOULD BE DELETED.

EQUIPMENT LIST

- A) CD-14 MECHANISM (MOD IMMATERIAL)
- B) SETTING TOOLS FOR CD-14
- C) SCREWDRIVER (THREE SIZES WERE USED, THE MIDDLE SIZE FITTED THE SLOT)
- D) CALENDAR WITH ONE INCH NUMERALS
- E) FIGURE 10, PAGE 26, OP 956, PREFERABLY A PHOTOSTAT ENLARGEMENT 17 BY 20 INCHES COVERED WITH CLEAR ACETATE
- F) POINTERS (FOR SCHEMATIC TRACING)

COMPONENT MODIFICATION

THE CD-14 MECHANISM SHOULD BE SET AS FOLLOWS FOR EACH SUBJECT:

- A) CAM FOLLOWERS IN OPERATED POSITION
- B) BOTH DA INDEX AND S INDEX OFF SCALE BETWEEN 145 DAYS AND 0 DAYS
- C) DIAL ASSEMBLY REPLACED AND SCREWED DOWN WITH S INDEX LINED UP WITH THE POINTER LABELED "SET ZERO HERE".

CONFIDENTIAL

CONFIDENTIAL

V
↓

TUBE STRAP

POINT TO THE DRAWING OF THE TUBE STRAP AND THE
CARD AND SAY:

FOLLOW THESE DIRECTIONS

HAND THE MN A PIECE OF STOCK LONGER THAN
6 1/4 INCHES.

NO CREDIT IF PENCIL OR OTHER
TOOL IS USED.

1) USES SCRIBER FOR
LAYOUT

☐

NO CREDIT IF BLADE WITH DAMAGED
TEETH IS SELECTED.

2) SELECTS UNDAMAGED
BLADE

☐

CREDIT ONLY IF 18 OR 24 TEETH PER
INCH BLADE IS SELECTED.

3) SELECTS PROPER BLADE

☐

AFTER MN HAS SELECTED A BLADE INSURE THAT HE
USES AN UNDAMAGED BLADE.

GIVE CREDIT IF, AFTER STARTING HACKSAW
CUT, AT LEAST 9 INCHES OF BLADE ARE
USED.

4) CUTS WITH WHOLE
BLADE

☐

5) CUTS OUTSIDE OF
SCRIBED LINE

☐

GIVE CREDIT TO A MN WHOSE RIGHT
FOOT IS FORWARD WHILE USING HACKSAW
ONLY IF HE IS LEFT HANDED.

6) LEFT FOOT FORWARD
WHILE USING HACK-
SAW

☐

7) NO TEETH MISSING
FROM BLADE

☐

8) USES FILE HANDLE

☐

CONFIDENTIAL

CONFIDENTIAL

W
-
Y

NO CREDIT IF ONLY PRICK PUNCH IS USED.

9) CENTER PUNCHES



SCORE MN'S LAYOUT BY PLACING PLASTIC LAYOUT JIG OVER HIS BAR SO THAT THE LEFT HAND .562 MARK COINCIDES WITH THE LEFT HAND .562 PUNCH MARK ON THE BAR.

NO CREDIT FOR ITEMS 10 THROUGH 12
IF PUNCH MARK DOES NOT TOUCH BOTH
CROSS-LINES ON JIG.

10) LAYOUT .281 DIA.
HOLE



11) LAYOUT .875 DIA.
HOLE



12) LAYOUT RIGHT HAND
.562 DIA. HOLE



SCORE THE LENGTH OF THE BAR AS A SEPARATE
OPERATION USING PLASTIC JIG.

13) LENGTH OF BAR
WITHIN TOLERANCE
LINES ON JIG



REARRANGE TOOLS IF NECESSARY AND INSURE THAT
STATION IS READY FOR NEXT MN.

CONFIDENTIAL

CONFIDENTIAL

TUBE STRAP MANUFACTURE - STATION 4

IN ADDITION TO BUORD DWG 415913 THE EXAMINEE WAS SHOWN A CARD WITH THE FOLLOWING DIRECTIONS:

YOU ARE TO MAKE A SEARCH COIL RETAINING BAR (TUBE STRAP) FOR MINE Mk 36 MOD I. MAKE IT TO THE SPECIFICATIONS OF THE DRAWING.

YOU WILL BE GRADED ON PROCEDURE, ABILITY TO USE THE RIGHT TOOLS, AND TO USE THEM PROPERLY. THE FINISHED PRODUCT WILL BE CHECKED AGAINST THE SPECIFICATIONS OF THE DRAWING.

IGNORE THE DIRECTIONS ABOUT STAMPING THE NUMBER 415913 ON THE STRAP. HAND THE STRAP TO THE EXAMINER WHEN YOU HAVE FINISHED ALL OPERATIONS EXCEPT DRILLING THE HOLES.

TOOLS ARE TO BE RETURNED TO THE POSITION IN WHICH YOU FOUND THEM.

ITEM CHARACTERISTICS

TUBE STRAP MANUFACTURE
STATION 4

ITEM	DIAGNOSTIC SCALE	PERCENT SUCCESS	CORRELATION WITH TOTAL SCORE
I	FP	70	.48**

CONFIDENTIAL

CONFIDENTIAL

ITEM	DIAGNOSTIC SCALE	PERCENT SUCCESS	CORRELATION WITH TOTAL SCORE
2	P	67	.08
3	FW	72	-.12
4	P	87	.00
5	FP	15	.07
6	P	98	-.11
7	P	95	-.17
8	P	40	.15
9	P	75	.13
10	P	65	.40**
11	P	63	.29*
12	P	72	.04
13	P	60	.36**

AVERAGE DIFFICULTY 66%
RANK ORDER 8

SUGGESTED CHANGES

THE ITEM ANALYSIS DATA FOR THIS STATION STRONGLY SUGGEST THAT IT BE REVISED FROM THE CHECK LIST FORMAT INTO A FINAL PRODUCT CHECK. THIS WOULD RELEASE AN EXAMINER FROM CAREFULLY WATCHING EACH STEP OF THE MINEMAN'S PERFORMANCE AND ALSO REVISE THE CONTENT OF THE STATION. THE EASE WITH WHICH MINEMEN SUCCESSFULLY COMPLETED MOST OF THE SELECTION AND USE

CONFIDENTIAL

CONFIDENTIAL

OF TOOLS ITEMS MAKE THIS REVISION REALISTIC. IN ITS PROJECTED FORM THE MINEMAN COULD BE GIVEN THE SAME DIRECTIONS AND EQUIPMENT, AND THEN LEFT WITHOUT CLOSE SUPERVISION TO COMPLETE THE PRODUCT. THIS COULD BE SCORED AT THE EXAMINER'S LEISURE. WHILE THE REVISION WOULD RESULT IN DROPPING ITEMS IT WOULD NOT CHANGE THE TIME OF ADMINISTRATION SIGNIFICANTLY.

EQUIPMENT LIST

THE GEAR LISTED BELOW WAS AVAILABLE AT THIS STATION AS PRESENTED IN THIS RESEARCH PROJECT. IT SHOULD BE NOTED THAT SOME OF THE TOOLS ARE NOT RELEVANT TO THE JOB AT HAND. THIS STATION WAS USED AS A "TOOL BOX" FOR THE REST OF THE STATIONS. THE TOOLS WERE DISPLAYED FOR EACH SUBJECT GROUPED AS FOLLOWS:

STEEL SCALE, 12 INCHES
COMBINATION SQUARE, 4 INCH
STEEL SCRIBER
DIVIDERS, 8 INCH
PRICK PUNCH, 3/8 INCH
CENTER PUNCH, 3/8 INCH
LEAD PENCIL

HACKSAW BLADES, 12 INCH (ONE DAMAGED AND ONE UNDAMAGED OF EACH OF THE FOLLOWING SIZES, 18, 24, 32 TEETH PER INCH)

HACKSAW FRAME, 12 INCH
SMOOTH FILE, 8 INCH
BASTARD FILE, 8 INCH
FILE HANDLE
FILE BRUSH

BALL PEEN HAMMER
DIAGONAL CUTTING PLIERS
LONG NOSE PLIERS
SCREWDRIVERS
CRESCENT WRENCH, 6 INCH
SPINTITE WRENCH SET

CONFIDENTIAL

CONFIDENTIAL

IN ADDITION TO THE TOOLS THE FOLLOWING EQUIPMENT IS NECESSARY:

- A) CARBON STEEL BAR, SAE 10, 1/4 BY 1 3/4 INCH
STOCK NO. G46-5-6935-800 (SUFFICIENT QUANTITY TO PRESENT
EACH SUBJECT WITH A PIECE OF STEEL LONGER THAN 6 1/4 INCHES)
- B) BENCH VISE WITH 3 INCH JAWS
- C) TRANSPARENT PLASTIC GAGE MADE TO THE SPECIFICATION OF THE
TUBE STRAP BUT SLIGHTLY LONGER SO THAT GO-NOGO MARKS FOR THE
LENGTH OF THE BAR CAN BE INSCRIBED ON THE SURFACE
- D) BUORD DWG 415913 MOUNTED AND COVERED WITH CLEAR ACETATE

COMPONENT MODIFICATION

NONE.

CONFIDENTIAL

M
↓

CONFIDENTIAL

FIRING MECHANISM M-5

AS YOU CAN SEE THIS IS AN M-5 MOD 1 FIRING MECHANISM:
WHAT IS THE MARK NUMBER OF THE MINES IN WHICH IT IS
USED?

CREDIT GIVEN IF NO MOD WAS MENTIONED
(MK 10 MOD 1 EMPLOYS A CHEMICAL HORN)

1) MARK 10



POINT TO THE CARD AND SAY:

FOLLOW THESE DIRECTIONS

WHEN HE STARTS, WATCH HIM TO SEE THAT HE COMPLETES
THE OPERATIONS IN THE SCORING COLUMN.

NO CREDIT IF MN STARTS TO DO SOMETHING
ELSE BEFORE FUSING NEEDLE CLAMP, OR
ROCKS THE MECHANISM.

2) FUSES NEEDLE CLAMP
FIRST



IF HE STARTS TO DO SOMETHING ELSE BEFORE FUSING
NEEDLE CLAMP TELL HIM TO FUSE IT FIRST.

3) USES PLASTIC TOOL



4) USES LARGER FUSE
WIRE



NO CREDIT IF MN NEGLECTS TO
TIGHTEN ANY ONE SCREW.

5) TIGHTENS ALL SCREWS



6) WINDS TORQUE CONTROL
BEFORE FUSING
IT



7) HOLDS PAWL OFF RIM



CONFIDENTIAL

CONFIDENTIAL

N
↓

NO CREDIT IF MN NEGLECTS TO TIGHTEN
ANY ONE SCREW.

- 8) USES SMALLER WIRE
TO FUSE TORQUE
CONTROL ☐
- 9) TIGHTENS ALL
TORQUE CONTROL
SCREWS ☐
- 10) CHECKS INSTALLED
FUSE WIRE FOR
BOWING ☐
- 11) ZEROS OHMMETER
BEFORE CHECKING
CONTINUITY ☐
- 12) FINDS OPEN GIMBAL
SPRING CONTACT ☐
- 13) CHECKS ANTI-
PREMATURE FUSE
WITH OHMMETER ☐
- 14) REPORTS BREAK IN
WIRE BETWEEN FUSE
AND GIMBAL SPRING
CONTACT ☐

WHEN MN BEGINS VISUAL INSPECTION SAY:

TELL ME WHEN YOU HAVE FINISHED YOUR INSPECTION

- 15) REPORTS LACK OF
DAMPING FLUID ☐

CONFIDENTIAL

CONFIDENTIAL



NO CREDIT IF MN LEAVES ANY OTHER FUSE WIRE IN OR ON THE MECHANISM.

16) REMOVES PLANTED FUSE WIRE



WHICH IS THE NORTH END OF THE NEEDLES?

HOW DO YOU KNOW?

NO CREDIT UNLESS MN MENTIONS THE RED DOTS ON THE NEEDLES.

17) IDENTIFIES N END



PUT YOUR FINGER ON THE HOLD-ON COIL

18) INDICATES HOLD-ON COIL



HAND THE MICROMETER AND PIECE OF .0063 WIRE TO THE MN AND SAY:

MEASURE THIS WIRE AND TELL ME ITS DIAMETER TO THE NEAREST TEN THOUSANDTH OF AN INCH

GIVE CREDIT IF REPORT IS .0061 - .0065.
NO CREDIT BELOW OR ABOVE THESE LIMITS

19) REPORTS .0061 - .0065



MOVE OHMMETER OFF ZERO
PLANT FUSE WIRE
CLIP BOTH FUSE WIRES, NEEDLE CLAMP FUSE FIRST

CONFIDENTIAL

CONFIDENTIAL

FIRING MECHANISM M-5 - STATION 5

THE FOLLOWING INFORMATION WAS PRESENTED ON A 5 BY 8 CARD:

USING THE EQUIPMENT PROVIDED ON THE TABLE, FUSE THE MECHANISM AND WIND THE TORQUE CONTROL. (TURN WHEEL CLOCKWISE).

TEST THE CABLE LEADS WITH THE OHMMETER. THERE SHOULD BE AN OPEN CIRCUIT BETWEEN THE BLACK AND YELLOW LEADS AND A CLOSED CIRCUIT (RESISTANCE OF 2 OHMS OR LESS) BETWEEN THE BLACK AND GREEN. CHECK THE RESISTANCE BETWEEN THE LUG TERMINAL OF THE YELLOW LEAD AND THE POINT WHERE THE YELLOW LEAD CONNECTS TO THE MECHANISM. THE RESISTANCE SHOULD BE 1 OHM OR LESS.

MAKE A ROUTINE VISUAL INSPECTION OF THE MECHANISM AND BE SURE TO CALL THE EXAMINER'S ATTENTION TO ANYTHING ABOUT THE MECHANISM WHICH IS OUT OF THE ORDINARY, WHILE YOU ARE WORKING, PART OF YOUR SCORE DEPENDS ON THIS.

TELL THE EXAMINER WHEN YOU HAVE FINISHED.

CONFIDENTIAL

CONFIDENTIAL

ITEM CHARACTERISTICS

FIRING MECHANISM M-5
STATION 5

ITEM	DIAGNOSTIC SCALE	PERCENT SUCCESS	CORRELATION WITH TOTAL SCORE
1	F	63	.51**
2	PW	23	.46**
3	FP	20	.40**
4	FPW	58	.71**
5	P	77	.46**
6	FP	35	.63**
7	FP	22	.58**
8	FP	62	.46**
9	P	47	.40**
10	PW	08	.30*
11	PW	48	.43**
12	PW	45	.64**
13	PW	30	.17
14	PW	40	.63**
15	FP	40	.56**
16	P	08	.30*
17	F	78	.58**
18	F	25	.62**
19	P	17	.50**

CONFIDENTIAL

CONFIDENTIAL

AVERAGE DIFFICULTY 38%
RANK ORDER 2

SUGGESTED CHANGES

THE ONLY REVISION THAT CAN BE SUGGESTED FOR THIS STATION IS THE ADDITION OF A SCORING STANDARD FOR ITEMS 12 AND 14. THE STANDARD SUGGESTED WAS EMPLOYED IN THE PRESENT STUDY BUT LEFT OFF THE SCORING FORMS BY MISTAKE.

OPPOSITE THESE ITEMS SHOULD BE THE FOLLOWING:

NO CREDIT IF DISCOVERED BY OTHER MEANS THAN USING THE OHMMETER.

EQUIPMENT LIST

- A) FIRING MECHANISM M-5 MOD I (A REJECTED MECHANISM MAY BE USED)
- B) TURNTABLE FROM A TEST SET MK I
- C) OHMMETER, 1/4 AMP.
- D) SPOOL OF FUSE WIRE, .0035 INCH
- E) SPOOL OF FUSE WIRE, .0063 INCH
- F) DIAGONAL CUTTING PLIERS
- G) SCREWDRIVER
- H) PLASTIC CLAMP
- I) MICROMETER, 0-1 INCH

COMPONENT MODIFICATION

FIRING MECHANISM M-5

- A) FIRING MECHANISM WITH HEMISPHERES REMOVED, MOUNTED IN THE TURNTABLE
- B) GIMBAL SPRING CONTACT OPEN WHERE GREEN LEAD IS CONNECTED
- C) YELLOW LEAD BROKEN (INSIDE INSULATION) BETWEEN ANTI-PREMATURE FUSE AND GIMBAL SPRING CONTACT
- D) ANTI-PREMATURE FUSE INSTALLED
- E) FLUID DRAINED FROM DAMPING DEVICE
- F) FUSE WIRE, 1 INCH LONG, BENT AND PLANTED ON BALANCING WEIGHT SCREW

OHMMETER OFF ZERO

CONFIDENTIAL

CONFIDENTIAL

P
↓

FIRING MECHANISM A-8

POINT TO CARDS TAPED TO TEST SETS AND SAY:

FOLLOW THE DIRECTIONS ON THESE TWO CARDS

NO CREDIT IF ANY OTHER CABLE IS CONNECTED BEFORE IIO CABLE IS PLUGGED IN.

1) CONNECTS TEST SET TO POWER SOURCE



2) HEATER-OFF-ON TO ON



IF MN GOES ANY FURTHER THAN COMPLETING ITEMS 1 AND 2 IN CONNECTING THE MK 65 MOD 1, STOP HIM AND TELL HIM TO SET UP THE TEST POT.

CREDIT GIVEN IF ONLY PRIOR ACTION IS COMPLETION OF ITEMS 1 AND 2

3) SETS UP TEST POT FIRST



NO CREDIT IF TEST POT TOUCHES A-8 MECHANISM BEFORE ADAPTER IS INSERTED

4) USES ADAPTER



IF MN STARTS TO TIGHTEN POT ON MECHANISM WITHOUT USING THE ADAPTER, TELL HIM TO USE IT.

NO CREDIT IF ANY DISASSEMBLY IS REQUIRED FOR INSERTION.

5) USES ADAPTER GASKET



NO CREDIT IF TEST POT TOUCHES A-8 MECHANISM BEFORE ADJUSTMENT IS MADE

6) ADJUSTS CLAMP ASSEMBLY TO APPROXIMATE POSITION



JUST BEFORE MN HAS PUMPED POT TO 35 PSI, SCORE CAM LEVER POSITION.

NO CREDIT IF LEVER CAN BE MOVED TO TOUCH ANY CLAMP OR IS NOT IN CENTER POSITION.

7) POSITION OF CAM LEVER



CONFIDENTIAL

CONFIDENTIAL

Q
↓

WHY DOES THE PRESSURE NORMALLY DROP SLIGHTLY AFTER YOU HAVE PUMPED IT TO 35 POUNDS PER SQUARE INCH?

- 8) PRESSURE DROPS AS HEAT OF PUMPING DISSIPATES



IF MN ANSWERS "LEAKAGE" SAY: IT WOULDN'T LEAK UNDER NORMAL CONDITIONS, AND WAIT FOR A FURTHER ANSWER.

POINT TO MK 65 TEST SET AS YOU SAY:

SET UP THE OTHER TEST SET NOW; YOU WILL GET DIRECTIONS TO BLEED THE TEST POT LATER. LET ME KNOW WHEN YOU HAVE FINISHED PREPARING THIS TEST SET.

WATCH AS EACH OF THE FOUR AMPHENOL PLUGS IS CONNECTED TO SEE THAT IT IS VISUALLY CHECKED AND SCREWED DOWN.

- 9) MECH AMPHENOL PLUG VISUAL



- 10) MECH AMPHENOL PLUG SCREW



- 11) BATT AMPHENOL PLUG VISUAL



- 12) BATT AMPHENOL PLUG SCREW



- 13) SR-7 AMPHENOL PLUG VISUAL



- 14) SR-7 AMPHENOL PLUG SCREW



AFTER MN TELLS YOU HE HAS FINISHED PREPARING THE TEST SET, SCORE POTENTIOMETER DIAL SETTINGS AND GALVANOMETER CLAMP RELEASE.

- 15) LOWER DIAL TO 1.3 MA.



CONFIDENTIAL

CONFIDENTIAL

R
↓

16) UPPER DIAL TO
5.05 MA.



17) GALVANOMETER
NEEDLE RELEASED



COMPLETE ANY TASK NOT DONE OR DONE INCORRECTLY IN
SETTING UP THE MK 65 TEST SET. THEN TELL THE MN:

THIS EXAMINATION DOES NOT INCLUDE THE SR-7 MOD 2
TEST SO DO THE SR-9 MOD 0 TIME-OUT TEST NOW.
FOLLOW THE DIRECTIONS ON THIS CARD

HAND CARD TO MN. IF MN PROCEEDS TO STEP G ON
THE CARD WITHOUT BLEEDING THE TEST POT TELL HIM
TO BLEED IT.

NO CREDIT UNLESS GAGE IS TAPPED AFTER
LAST TIME VALVE IS OPENED FOR BLEEDING.

18) TAPS GAGE WHILE
BLEEDING PRESSURE



READ THE TIMER WHEN THE SR-9 CLOSSES AND COMPARE
YOUR RESULT WITH THE MN'S REPORT.

CREDIT GIVEN IF TIME RECORDED IS PLUS
OR MINUS .02 SECONDS OF EXAMINER'S
READING.

19) TIME CORRECT



20) REPORTS OIL ON MECH



WHEN MN REPORTS THAT HE HAS FINISHED, TELL HIM TO
DISCONNECT THE COMPONENTS AND THE POT.

21) BLEEDS POT TO 0
BEFORE LOOSENING
SCREW



REMOVE GASKET FROM ADAPTER
READJUST CLAMP ON POT
CAM LEVER IN CENTER POSITION
DISCONNECT MK 65 FROM 110 SOURCE

HEATER-OFF-ON TO OFF
LOWER POTENTIOMETER TO 0
UPPER POTENTIOMETER TO 2
CLAMP GALVANOMETER

CONFIDENTIAL

CONFIDENTIAL

FIRING MECHANISM A-8 - STATION 6

THE FOLLOWING INFORMATION, TYPED ON A CARD, WAS TAPED TO THE
PRESSURE POT:

THE TEST POT IS TO BE BROUGHT TO 31.5 POUNDS PER
SQUARE INCH, TO DO THIS BRING THE PRESSURE TO ABOUT
35 POUNDS PER SQUARE INCH AND AFTER ABOUT 5 MINUTES
BLEED THE PRESSURE TO THE RED LINE ON THE GAGE (31.5
PSI). THE PRESSURE IS FIRST BROUGHT TO 35 POUNDS
SINCE IT WILL NORMALLY DROP SLIGHTLY AFTER PUMPING.

THIS INFORMATION WAS TAPED TO THE TEST SET COVER:

THE 6J5 TUBE IN THIS TEST SET REQUIRES A MINUTE
TO WARM UP SO THROW THE HEATERS-OFF-ON SWITCH TO ON.
THE ACCURACY OF THE TIMER HAS BEEN CHECKED, THE MI-
CROAMPERE SUPPLY HAS BEEN BALANCED AND THE GALVANO-
METER HAS BEEN ZEROED. CONNECT THE COMPONENTS ON
THE BENCH FOR TESTING THE A-8 AND THE SR-7 MECHANISMS.
SET THE CONTROLS AS FOLLOWS:

SELECTOR SWITCH TO POSITION I

OUT-SC SWITCH TO OUT

RESET-TEST SWITCH TO RESET AND BACK TO CENTER

LOWER POTENTIOMETER DIAL TO 1.3 MICROAMPERES

UPPER POTENTIOMETER DIAL TO 5.05 MICROAMPERES

CONFIDENTIAL

CONFIDENTIAL

THE CARD MENTIONED ON THE SCORING FORM BETWEEN ITEMS 17 AND 18 CONTAINED THIS INFORMATION:

SR-9 Mod 0 TIME-OUT TEST

- A. SET SELECTOR SWITCH AT 2
- B. RESET-TEST SWITCH TO RESET AND BACK TO CENTER
- C. SELECTOR SWITCH AT 3 (IF MOTOR RUNS, REMAIN AT 3 UNTIL IT STOPS)
- D. SELECTOR SWITCH AT 2
- E. RESET TIMER
- F. WAIT AT LEAST TWO MINUTES. (BLEED THE PRESSURE POT WHILE YOU ARE WAITING)
- G. RESET-TEST SWITCH TO TEST AND BACK TO CENTER

THE TIMER WILL RECORD THE TIME IT TAKES THE SR-9 MOD 0 TO CLOSE. REPORT THIS TIME (NEAREST 1/100 SECONDS) TO THE EXAMINER AND VISUALLY CHECK THE A-8 MECHANISM. TELL THE EXAMINER WHEN YOU ARE FINISHED.

ITEM CHARACTERISTICS

FIRING MECHANISM M-8
STATION 6

ITEM	DIAGNOSTIC SCALE	PERCENT SUCCESS	CORRELATION WITH TOTAL SCORE
I	P	52	-.03

CONFIDENTIAL

CONFIDENTIAL

ITEM	DIAGNOSTIC SCALE	PERCENT SUCCESS	CORRELATION WITH TOTAL SCORE
2	P	75	-.13
3	P	17	.00
4	FP	42	.38**
5	FP	70	.56**
6	P	17	.34**
7	FP	72	.33**
8	FW	13	.26
9	P	85	.49**
10	P	87	.44**
11	P	88	.06
12	P	88	.06
13	P	85	.49**
14	P	80	.40**
15	P	85	.29*
16	P	65	.26
17	FP	18	.05
18	FPW	05	.42
19	P	75	.21
20	FP	37	.30*
21	P	75	.13

CONFIDENTIAL

CONFIDENTIAL

AVERAGE DIFFICULTY 58%
RANK ORDER 7

SUGGESTED CHANGES

IN SPITE OF THE HIGH LEVEL OF DISCRIMINATION SHOWN BY MANY OF THE ITEMS OF THIS STATION REVISION WOULD IMPROVE IT AND AT THE SAME TIME SHORTEN IT. THE FIRST THREE ITEMS SHOULD BE DROPPED AND APPROPRIATE CHANGES IN DIRECTIONS MADE FOR THE SUBJECT. ITEMS 9 THROUGH 14 ARE TOO EASY BUT IN VIEW OF THEIR DISCRIMINATION LEVEL AND KEEPING CONTENT VALIDITY IN MIND THEY SHOULD PROBABLY BE RETAINED. ITEMS 17 AND 18 SHOWED UP IN THE 15 MAN PRELIMINARY TRYOUT AS TOO DIFFICULT BUT WERE RETAINED IN THE FINAL FORM IN THE HOPE THAT THEIR CONDITION WOULD IMPROVE WITH A LARGER SAMPLE. AS CAN BE SEEN FROM THE TABLE ABOVE THE LARGER SAMPLE DID NOT HELP. BOTH ITEMS COULD BE MADE MUCH EASIER BY INCLUDING SPECIFIC INSTRUCTIONS TO PERFORM THEM; PERHAPS THEY WOULD NOT BECOME TOO EASY.

THIS STATION COULD BE MADE SHORTER WITHOUT AFFECTING ITS VALIDITY SERIOUSLY BY DROPPING THE SR-9 MOD 0 TIME-OUT TEST. ITEM 19, WHICH TURNED OUT TOO EASY AND ALSO INSIGNIFICANT WOULD BE THE ONLY SACRIFICE.

EQUIPMENT LIST

AS PRESENTED IN THIS RESEARCH THE STATION REQUIRED:

- A) FIRING MECHANISM A-8 MOD 0 (IF THE SR-9 TIME-OUT TEST IS DELETED A REJECTED MECHANISM MAY BE USED)
- B) TEST SET MK 65 MOD 1
- C) TEST SET MK 66 MOD 1
- D) BA-249/U BATTERIES (TWO ARE NECESSARY)
- E) SR-7 MOD 2 MECHANISM

CONFIDENTIAL

CONFIDENTIAL

COMPONENT MODIFICATION

TEST SET Mk 65 Mod 1

A) SWITCH SETTINGS AT THE START OF EACH EVALUATION:

HEATERS-OFF-ON ON OFF
RESET-TEST ON OFF
LOWER POTENTIOMETER ON 0
UPPER POTENTIOMETER ON 2
SELECTOR SWITCH ON 1
GALVANOMETER NEEDLE CLAMPED

B) BATTERY CABLE PROPERLY CONNECTED TO THE BATTERIES BUT NOT TO THE TEST SET.

C) CA-744 PROPERLY CONNECTED

LEADS TO DISCONNECTED PURPLE LEAD
LEAD T TO LUG ON JONES BLOCK FROM WHICH PURPLE LEAD WAS REMOVED.

TEST SET Mk 66 Mod 1

- A) ONE OF THE TEST POTS, ADAPTER, GASKET, AND PUMP, AVAILABLE WITHOUT REMOVING CLAMPING BLOCKS
- B) CLAMP ASSEMBLY OF TEST POT NEAR TOP OF SCREW
- C) CAM LEVER IN CENTER POSITION

FIRING MECHANISM A-8 Mod 0

- A) GREASE OR HYDRAULIC FLUID SMEARED ON ONE OF THE TUBE COUPLINGS

CONFIDENTIAL

H
↓

CONFIDENTIAL

SOLDERING

POINT TO CARD AND SAY TO MN:

READ THESE DIRECTIONS AND WEAR THE SAFETY GLASSES
WHILE SOLDERING.

NO CREDIT FOR ANY ITEM (6 THROUGH 10,
SCORED INDIVIDUALLY) IF SOLDER IS
APPLIED TO CONTACT PIN BEFORE IT IS
HEATED (SOLDER FLOWS ON).

NO CREDIT IF ANY ONE LEAD IS RELEASED
BEFORE SOLDER SETS.

1) CLEANS IRON BEFORE
FILING

☐

2) FILES IRON TIP .

☐

3) TINS IRON

☐

4) SELECTS ROSIN
CORE SOLDER

☐

5) TINS ALL LEADS

☐

6) HEATS PIN A (WHITE)

☐

7) HEATS PIN B (BLACK)

☐

8) HEATS PIN C (RED)

☐

9) HEATS PIN D (BROWN)

☐

10) HEATS PIN E (GREEN)

☐

11) DOES NOT MOVE LEADS
UNTIL SOLDER SETS

☐

12) DID NOT DIP IRON
IN FLUX

☐

CONFIDENTIAL

CONFIDENTIAL

I
↓

SCORE ITEMS 13 THROUGH 19 AFTER THE MN TELLS YOU HE IS FINISHED.

AMPHENOL ASSEMBLY MUST BE CORRECTLY POSITIONED FOR CREDIT.

13) CABLE CLAMP
THREADED ON CABLE

☐

14) ALL CONNECTIONS
CORRECT

☐

NO CREDIT IF DROPS OF SOLDER ARE PRESENT IN SOCKET OR IF EXCESS ROSIN OR SOLDER ARE PRESENT.

15) ALL CONNECTIONS
CLEAN

☐

NO CREDIT IF ANY ONE OF THE LEADS IS NICKED WHERE THE OUTER INSULATION HAS BEEN REMOVED.

16) LEAD INSULATION
NOT NICKED

☐

NO CREDIT IF LEAD LENGTH EXCEEDS ONE INCH.

17) LEAD LENGTH

☐

NO CREDIT IF ANY ONE GAP BETWEEN LEAD INSULATION AND CONTACT PIN IS IN EXCESS OF 1/32 INCH.

18) INSULATION GAP

☐

19) VINYL TUBING ON
ALL LEADS

☐

FILE TIN OFF IRON, FOUL TIP AND INSURE THAT IRON IS HOT FOR NEXT MN.

CONFIDENTIAL

CONFIDENTIAL

SOLDERING - STATION 7

THIS INFORMATION WAS COVERED WITH CLEAR ACETATE AND TAPED TO THE
WORK BENCH:

USING ANY OF THE GEAR ON THE TABLE YOU ARE TO
SOLDER THE FIVE CONDUCTOR CABLE LEADS TO THE CONTACT
PINS OF THE AMPHENOL PLUG AS DESCRIBED BELOW.

THE FINISHED PRODUCT SHOULD BE AN AMPHENOL
PLUG PROPERLY ASSEMBLED AND SECURED TO THE CABLE.

FOLLOW THESE INSTRUCTIONS:

- A. SOLDER THE PLUG TO THE END OF THE ROLL OF
CABLE. DO NOT CUT A LENGTH FROM ROLL.
- B. THE AMPHENOL SOCKET AND COUPLING RING ARE
TO BE PLUGGED INTO THE RECEPTACLE ON THE
BENCH.
- C. SOLDER THE LEADS AS FOLLOWS:

WHITE TO CONTACT PIN A

BLACK TO CONTACT PIN B

RED TO CONTACT PIN C

BROWN TO CONTACT PIN D

GREEN TO CONTACT PIN E
- D. TELL THE EXAMINER WHEN YOU HAVE FINISHED
EVERYTHING EXCEPT REASSEMBLING THE PLUG.

CONFIDENTIAL

CONFIDENTIAL

ITEM CHARACTERISTICS

SOLDERING
STATION 7

ITEM	DIAGNOSTIC SCALE	PERCENT SUCCESS	CORRELATION WITH TOTAL SCORE
1	FP	35	.17
2	P	32	.12
3	P	42	.24
4	F	72	-.03
5	P	42	.64**
6	P	58	.45**
7	P	57	.28*
8	P	68	.43**
9	P	65	.33**
10	P	57	.34**
11	FP	40	.42**
12	F	38	.03
13	P	65	.11
14	P	85	.18
15	P	52	.55**
16	P	45	.17
17	P	70	.24
18	P	02	-.17
19	FP	60	.42**

CONFIDENTIAL

CONFIDENTIAL

AVERAGE DIFFICULTY 54%
RANK ORDER 6

SUGGESTED CHANGES

THE ITEMS WHICH WERE MOST DISCRIMINATING APPEARED TO BE THOSE WHICH WERE SCORED ON THE BASIS OF SOLDERING OPERATIONS RATHER THAN THE PREPARATION FOR SOLDERING, OR THE FINAL PRODUCT. A SHORTER STATION (THIS WAS ONE OF THE LONGEST) WOULD BE ACHIEVED THROUGH PREPARING THE IRON, RESTRICTING CHOICE OF MATERIALS TO THE CORRECT ONES, AND SCORING ONLY ITEMS 5 THROUGH 11 IN ADDITION TO 15 AND 19.

EQUIPMENT LIST

MATERIALS

- A) RECEPTACLE FOR 5-PIN AMPHENOL PLUG (MOUNTED ON BENCH)
- B) AMPHENOL PLUGS (5-PIN, LETTERED) COMPLETE, ONE FOR EACH EXAMINEE
- C) FIVE-CONDUCTOR RUBBER COVERED CABLE (EACH MAN USED ABOUT THREE INCHES FROM THE ROLL)
- D) CAN PASTE FLUX
- E) ROLL SOLDER 50-50, ACID CORE
- F) ROLL SOLDER 50-50 ROSIN CORE
- G) RAGS
- H) ROLL FRICTION TAPE (FOR FOULING IRON)
- I) SHORT PIECES OF VINYL TUBING FOR LEAD INSULATION

TOOLS

- A) ELECTRIC SOLDERING IRON, 3/8 INCH PYRAMIDAL TIP
- B) SOLDERING IRON TIPS (SEVERAL REQUIRED)
- C) JACKKNIFE
- D) SCREWDRIVER, 4 INCH
- E) WIRE STRIPPERS
- F) NEEDLE NOSE PLIERS
- G) DIAGONAL CUTTING PLIERS
- H) STEEL SCALE, 6 INCH
- I) FILE, SMOOTH, SINGLE CUT, 8 INCH

CONFIDENTIAL

CONFIDENTIAL

COMPONENT MODIFICATION

THE SOLDERING IRON TIP WAS FILED, BETWEEN SUBJECTS, TO REMOVE ALL TRACES OF PREVIOUS TINNING, AND FOULED BY RUBBING ALL FACES OF IT ON FRICTION TAPE.

CONFIDENTIAL

E
↓

CONFIDENTIAL

OPERATIONAL TEST

AS YOU CAN SEE THIS IS A MINE MK 36 MOD 1, AN M-9
MOD 1 FIRING MECHANISM IS USED IN IT. WHAT TYPE
OF FIRING MECHANISM IS THE M-9 MOD 1?

NO CREDIT FOR MAGNETIC OR INDUC-
TION ALONE.

1) MAGNETIC-INDUCTION

☐

POINT TO CARDS AND THEN TEST SET DESCRIPTION AND SAY:

READ THESE CARDS AND THESE DIRECTIONS

NO CREDIT UNLESS COIL IS PLACED
BETWEEN SUSPENSION LUGS.

2) PLACES EXCITER
COIL

☐

3) EXCITER COIL AM-
PHENOL VISUAL

☐

4) SELECTOR SWITCH
TO 3

☐

5) OPER-ADJ TO ADJ.

☐

6) SETS TO 200 MA
WITHOUT ASSISTANCE

☐

WHEN MN ATTEMPTS TO ADJUST TO 200 MA ASK HIM:

WHICH SCALE ARE YOU READING?

7) REPORTS D SCALE

☐

GIVE CREDIT IF MN LOOKS INTO CLOCK
WELL AT TB-10 BEFORE GIVING FIRST
LOOK.

8) EXAMINES TB-10

☐

9) DOES NOT CHANGE
SELECTOR SWITCH

☐

CONFIDENTIAL

CONFIDENTIAL

F
↓

WATCH MN DURING THE SETTING OF CONTROLS TO INSURE THAT HE CLOSSES SWITCH A MOMENTARILY.

10) OPER-ADJ TO OPER ☐

11) SWITCH A CLOSED MOMENTARILY ☐

12) SWITCH B CLOSED ☐

WHEN MN INDICATES THAT HE IS READY TO GIVE THE MECHANISM A LOOK, CHECK THE TEST SET CONTROLS AND PLACEMENT OF EXCITER COIL, SCORE HIS SETTINGS, MAKE ANY NECESSARY ADJUSTMENTS OR CHANGES AND CONNECT SEARCH COIL.

WHEN YOU HAVE FINISHED MAKING ADJUSTMENTS, HAND HIM CARD NO. 2 AND SAY:

PROCEED WITH THE TEST.

13) STARTS WATCH WHILE GIVING FIRST LOOK ☐

14) GIVES BOTH LOOKS WITHOUT ASSISTANCE ☐

WHEN MN READS METER NO. 1 DURING THE CYCLE ASK HIM:

WHICH SCALE ARE YOU READING?

15) REPORTS F SCALE ☐

IF MN DOES NOT REPORT OVER-ALL CYCLE TIME ASK HIM FOR THIS INFORMATION AND SCORE AS THOUGH IT WERE VOLUNTEERED.

NO CREDIT IF OVER-ALL ERROR EXCEEDS 10 SECONDS.

16) REPORTS OVER-ALL CYCLE TIME ☐

CONFIDENTIAL

G



CONFIDENTIAL

IF MN HAS NOT ALREADY REPORTED FIRING
INDICATION ASK HIM:

DID YOU GET AN INDICATION OF FIRING ON THE TEST SET?

IF NECESSARY ASK HIM: WHAT WAS IT?

17) REPORTS FIRING
INDICATION



DISCONNECT SEARCH COIL LEAD AND INSURE THAT
STATION IS READY FOR THE NEXT MN.

CONFIDENTIAL

CONFIDENTIAL

OPERATIONAL TEST - STATION 8

THE FOLLOWING MATERIAL TYPED ON 8 $\frac{1}{2}$ BY 11 PAPER WAS PRESENTED TO THE SUBJECT AS HE BEGAN WORK.

TEST SET DESCRIPTION

THE MATERIAL ON THESE PAGES IS A REVISED VERSION OF CHAPTER 5, OP 1860, MINE AND DEPTH CHARGE TEST SETS.

TEST SET Mk 3, MODS 0, 1, AND 2

TEST SET Mk 3, MODS 0, 1, AND 2 MEASURES RESISTANCE, VOLTAGE AND CURRENT, AND TESTS THE OPERATION OF MAGNETIC INDUCTION MINES. ALL THREE MODIFICATIONS PERFORM IDENTICAL FUNCTIONS, AND DIFFER ONLY IN CIRCUIT DETAIL. THE TEST SET IS USED DURING ASSEMBLY AND ISSUE TESTING OF THE UNITS IT TESTS.

SECTION 5.1
GENERAL DESCRIPTION AND CONTROLS

GENERAL DESCRIPTION

TEST SET Mk 3, IS CONTAINED IN A CASE AND IS EQUIPPED WITH CABLES FOR CONNECTING IT TO THE UNIT TO BE TESTED. WHEN NOT IN USE, THESE CABLES ARE STORED IN A WELL IN THE CASE. THE THREE MODIFICATIONS DIFFER SLIGHTLY IN THEIR FRONT PANEL CONTROLS; THESE DIFFERENCES ARE NOTED IN THE PARAGRAPH DESCRIBING THE CONTROLS.

CONFIDENTIAL

CONFIDENTIAL

CONTROLS, INDICATORS, AND CONNECTORS

THE TEST SET FRONT PANEL CONTAINS THE CONTROLS, METERS, AND CONNECTORS USED DURING CALIBRATION AND TEST PROCEDURES. THE MOD 2 TEST SET CONTAINS A SWITCH WHICH IS NOT PRESENT IN MOD 0 OR MOD 1; MOD 0 CONTAINS A SWITCH WHICH IS NOT PRESENT IN MOD 1 OR MOD 2; ENGRAVING AND TYPES OF SWITCHES USED IN MOD 0 DIFFER FROM THOSE OF THE OTHER TWO MODIFICATIONS. THE FRONT PANEL ELEMENTS INCLUDE THE FOLLOWING:

METER NO. 1 - THIS METER READS CURRENT OR RESISTANCE, DEPENDING ON THE SETTING OF THE SELECTOR SW AND THE OPER-ADJ SWITCH, ACCORDING TO THE FOLLOWING TABLE:

QUANTITY	METER NO. 1 SCALE READ	SWITCH POSITIONS	
		OPER - ADJ	SELECTOR SWITCH
SHORT-CIRCUIT CURRENT	0-50 AMP	ADJ	1
EXCITING CURRENT	0-100 MA	ADJ	2
MINE CYCLE CURRENT	0-10 AMP	OPER	2
EXCITING CURRENT	0-500 MA	ADJ	3
MINE CYCLE CURRENT	0-10 AMP	OPER	3
HIGH RESISTANCE	0-2000 OHMS	ADJ	4
HIGH RESISTANCE	0-50 OHMS	ADJ	5

SELECTOR SW AND OPER-ADJ SW - THESE SWITCHES ARE SET IN ACCORDANCE WITH THE ABOVE TABLE DURING TESTS.

CONFIDENTIAL

CONFIDENTIAL

R-1, R-2, AND R-3 OHM-METER ZERO ADJ - IN MOD 0 THESE CONTROLS ARE ENGRAVED, RESPECTIVELY, HIGH FINE, HIGH ADJUSTMENT-LOW FINE AND LOW COARSE ADJUSTMENT. WHEN THE SELECTOR SW IS IN POSITION 2 OR 3, THESE THREE CONTROLS ARE VARIED TO PRODUCE THE PROPER VALUE OF EXCITING CURRENT; THE LOWER ONE IS THE FINE ADJUSTMENT, THE ONE BELOW METER No. 1 IS THE MEDIUM ADJUSTMENT, AND THE ONE BELOW METER No. 2 IS THE COARSE ADJUSTMENT. WHEN THE SELECTOR SW IS AT POSITION 4 OR 5, THE COARSE ADJUSTMENT IS USED TO ZERO METER No. 1.

10 AMP - 1 AMP SWITCH - THIS SWITCH OCCURS ONLY IN MOD 2. IT IS USED TO CHANGE THE METER RANGE FROM 10 AMPERES TO 1 AMPERE (FOR GREATER ACCURACY IN READING BELOW 1 AMPERE) WHEN THE SELECTOR SW IS SET AT POSITION 2 OR 3 AND MINE CYCLE CURRENT IS BEING READ. (THIS SWITCH HAS BEEN TAPED IN THE 10 AMP POSITION AND SHOULD NOT BE TOUCHED.)

REV SW - (REVERSING SW IN MOD 0) CLOSING THIS SWITCH CONNECTS THE EXCITING CURRENT TO THE EXCITER COIL. (WHEN SELECTOR SWITCH IS IN POSITION 3).

PUSH BUTTON - THIS SWITCH OCCURS ONLY IN THE MOD 0 TEST SET. IT IS USED IN CONJUNCTION WITH THE REVERSING SW TO CONNECT THE EXCITING CURRENT TO THE EXCITER COIL.

SW "A" - CLOSING THIS SWITCH MOMENTARILY, RESETS SS-9.

SW "B" - THIS SWITCH MUST BE CLOSED BEFORE THE SS-8 WILL CYCLE. CLOSING IT WILL CAUSE THE SS-8 TO CYCLE HOME IF IT IS NOT AT HOME POSITION.

CONFIDENTIAL

CONFIDENTIAL

METER No. 2 - THIS DC VOLTMETER IS DIRECTLY CONNECTED TO THE SOURCE TO BE MEASURED, AND READS VOLTAGES UP TO 15 VOLTS. DURING MINE OPERATION TESTS, IT INDICATES MINE FIRING.

50 AMPS BINDING POSTS - THE BATTERY CABLES USED DURING SHORT-CIRCUIT CURRENT TESTS ARE CONNECTED TO THESE BINDING POSTS.

EXCITER COIL BINDING POSTS (ENGRAVED EXCITER HIGH OHMS IN MOD 0 TEST SET) - THE EXCITER COIL IS CONNECTED TO THESE BINDING POSTS. IN THE MOD 0 TEST SET, HIGH RESISTANCE ALSO IS MEASURED THROUGH THEM.

OHMS BINDING POSTS (ENGRAVED LOW OHMS IN THE MOD 0 TEST SET) - BOTH HIGH AND LOW RESISTANCES ARE MEASURED THROUGH THESE BINDING POSTS IN THE MODS 1 AND 2 TEST SETS; ONLY LOW RESISTANCE IS MEASURED THROUGH THEM IN THE MOD 0 TEST SET.

CABLE CONNECTOR ON SIDE OF TEST SET - THE CABLE CONNECTING THE TEST SET TO THE MINE IS ATTACHED TO THIS CONNECTOR.

THE FOLLOWING INFORMATION TYPED ON CARDS WAS HANDED TO THE SUBJECT ALONG WITH THE TEST SET DESCRIPTION:

CARD No. 1

YOU ARE TO MAKE AN OPERATIONAL TEST ON THE MINE Mk 36 MOD 1. THE INFORMATION YOU WILL NEED IS ON THE CARDS OR IN THE TEST SET DESCRIPTION. YOU DO NOT HAVE TO DEPEND ON YOUR MEMORY. THE ONLY

CONFIDENTIAL

CONFIDENTIAL

MODIFICATION THAT HAS BEEN MADE ON THE MINE IS A DISCONNECTED LEAD TO PREVENT YOU FROM ACCIDENTALLY GIVING THE MECHANISM A LOOK. THE EXAMINER WILL CONNECT THIS LEAD WHEN YOU ARE READY TO TEST. THE TEST SET AND THE COMPONENTS ARE IN ACCEPTABLE WORKING ORDER.

THE FOLLOWING INFORMATION WILL HELP YOU TO PREPARE FOR THE TEST:

- A. ALL CABLES HAVE BEEN PROPERLY CONNECTED FOR YOU, EXCEPT THE EXCITER COIL.
- B. THE SWITCHES OF THE CD-14 MECHANISMS ARE SET AS FOLLOWS:
 - DA SWITCHES IN OPERATED POSITION
 - S SWITCHES IN UNOPERATED POSITION
- C. USE AN EXCITING CURRENT OF 200 MILLIAMPS FOR THE TEST.

TELL THE EXAMINER WHEN YOU ARE READY TO GIVE THE MECHANISM A LOOK. YOU WILL BE GRADED ON WHETHER OR NOT YOU CAN PREPARE FOR THE TEST WITHOUT ASSISTANCE FROM THE EXAMINER. IF YOU NEED HELP ASK HIM.

THE CARD PRESENTED BETWEEN ITEMS 12 AND 13 INFORMED THE EXAMINEE THAT:

CONFIDENTIAL

CONFIDENTIAL

CARD No. 2

TWO LOOKS OF OPPOSITE POLARITY ARE REQUIRED TO FIRE
THE MECHANISM. DURING THE FIRST CYCLE OF THE FIRING
MECHANISM:

- A. OBTAIN AN INDICATION OF FIRING ON THE TEST SET
- B. DETERMINE AND REPORT TO THE EXAMINER THE FOLLOWING:
 - 1. OVER-ALL CYCLE TIME (FROM THE FIRST LOOK
UNTIL THE MECHANISM STOPS CYCLING)
 - 2. CURRENT DRAWN BY THE FIRING MECHANISM
WHILE IT IS CYCLING

ITEM CHARACTERISTICS

OPERATIONAL TEST MINE MK 36-1
STATION 8

ITEM	DIAGNOSTIC SCALE	PERCENT SUCCESS	CORRELATION WITH TOTAL SCORE
1	F	47	.20
2	F	62	.53**
3	P	93	.46**
4	W	53	.40**
5	FW	67	.46**
6	PW	35	.63**
7	W	42	.64**
8	FPW	12	.41**

CONFIDENTIAL

CONFIDENTIAL

ITEM	DIAGNOSTIC SCALE	PERCENT SUCCESS	CORRELATION WITH TOTAL SCORE
9	W	82	.27*
10	W	42	.51**
11	W	45	.64**
12	W	42	.64**
13	PW	48	.50**
14	FP	52	.43**
15	W	18	.37**
16	PW	18	.53**
17	W	73	.35**

AVERAGE DIFFICULTY 48%
RANK ORDER 3

SUGGESTED CHANGES

NO CHANGE APPEARS NECESSARY.

EQUIPMENT LIST

- A) MINE Mk 36 Mod 1, COMPLETELY ASSEMBLED (03 OPERATIONAL ASSEMBLY) WITHOUT PARACHUTE, AND INERT LOADED
- B) TEST SET Mk 3 Mod 2
- C) STOPWATCHES, (ONE FOR SUBJECT, ONE FOR EXAMINER)

COMPONENT MODIFICATION

MINE Mk 36 Mod 1

CONFIDENTIAL

CONFIDENTIAL

- A) FIRING MECHANISM M-9 Mod 1 SET TO FIRE ON TWO LOOKS
OF REVERSE POLARITY
- B) SS-8 AT HOME POSITION
- C) CD-14 SWITCHES

DA SWITCHES IN OPERATED POSITION
S SWITCHES IN UNOPERATED POSITION AND SET AT MAXIMUM DELAY
- D) TB-10 SET ON 1 AND REMOVED FROM CLOCK WELL
- E) ONE LEAD TO SEARCH COIL DISCONNECTED AT TERMINAL BOARD

TEST SET Mk 3 Mod 2

- A) SWITCHES SET AS FOLLOWS FOR EACH SUBJECT

OPER-ADJ AT OPER
REV SWITCH AT CENTER POSITION
SELECTOR SWITCH AT POSITION 1
SWITCH A AT OFF
SWITCH B AT OFF
10 AMP-1 AMP SWITCH AT 10 AMP (AND TAPED IN POSITION)
ALL 3 RHEOSTATS AT MINIMAL SETTINGS
- B) SCALES ON FACE OF LEFT HAND METER LABELED WITH LETTERS AS
FOLLOWS:

A 0-2000 OHM
B 0-50 OHM
C 0-500 MA
D 0-100 MA
E 10-50 AMP
F 2-10 AMP

(THESE LETTERS WERE WRITTEN ON A
THIN STRIP OF MASKING TAPE APPLIED
TO THE METER COVER GLASS)
- C) ALL CABLE CONNECTIONS CORRECTLY MADE FOR THE OPERATIONAL
TEST EXCEPT EXCITER COIL
- D) EXCITER COIL IN TEST SET COMPARTMENT
- E) METERS LABELED WITH MASKING TAPE, METER No. 1 (LEFT HAND
METER), METER No. 2 (RIGHT HAND METER)

CONFIDENTIAL

CONFIDENTIAL

BUTTON-UP

POINT TO CARD AND SAY:

FOLLOW THESE DIRECTIONS

IF MN STARTS TO USE TORQUE WRENCH (TOUCHES ON NUT)
STOP HIM AND SAY: USE THE SPEED WRENCH TO UNBUTTON
IT.

NO CREDIT IF MN STARTS WITH TORQUE
WRENCH.

AFTER NEW GASKET IS ON THE MINES TELL THE MN:
REPLACE THE DEFECTIVE GASKET. IF MN USES THE
DEFECTIVE GASKET GIVE NO CREDIT FOR ITEM 2 AND
DO NOT CORRECT HIM.

1) USES SPEED SOCKET
WRENCH TO UNBUTTON

☐

2) STARTS TO INSERT
NEW GASKET

☐

3) STARTS ALL STUDS
BY HAND

☐

4) SETS ALL STUDS TO
MODERATE TIGHTNESS

☐

5) USES TORQUE WRENCH
ON ALTERNATE-OPPOSITE
STUDS

☐

6) RECHECKS ALL STUDS
WITH TORQUE WRENCH

☐

7) SETS ALTERNATE-
OPPOSITE STUDS WHEN
RECHECKING

☐

CONFIDENTIAL



CONFIDENTIAL

BUTTON-UP - STATION 9

THE FOLLOWING INFORMATION TYPED ON A 3 BY 5 CARD WAS TAPED TO THE MINE CASE NEAR THE FILLING HOLE:

YOU ARE TO REMOVE THE COVER FROM THE FILLING HOLE IN THE NOSE OF THE MINE Mk 36 Mod 1, AND INSPECT THE GASKET FOR DEFECTS. THE COVER PLATE IS TO BE BUTTONED UP FOR A DRILL PLANT. SET ALL NUTS TO 16 POUND FEET. TELL THE EXAMINER WHEN YOU HAVE FINISHED.

ITEM CHARACTERISTICS

BUTTON-UP
STATION 9

ITEM	DIAGNOSTIC SCALE	PERCENT SUCCESS	CORRELATION WITH TOTAL SCORE
1	P	98	.17
2	P	70	.56**
3	P	98	.17
4	P	83	-.11
5	FP	55	.51**
6	FP	73	.25
7	FP	28	.54**

CONFIDENTIAL

CONFIDENTIAL

AVERAGE DIFFICULTY 71%
RANK ORDER 9
(LEAST DIFFICULT)

SUGGESTED CHANGES

THE ITEMS WHICH TURNED OUT TO BE INSIGNIFICANT AS FAR AS DISCRIMINATION IS CONCERNED WERE ALL TOO EASY. HOWEVER, IN VIEW OF THE DISSIMILARITY OF THE JOB DONE AT THIS STATION WHEN COMPARED TO MOST OF THE OTHERS IT WOULD PROBABLY NOT INFLUENCE VALIDITY TO RETAIN THEM. TWO ADDITIONS CAN BE SUGGESTED:

- (1) PRESENT A SERIES OF GASKETS WITH VARYING DEGREES OF DEFECTS FOR ACCEPTANCE OR REJECTION.
- (2) SCORE HOW CLOSE THE MINEMAN CAME TO THE 15 FOOT-POUNDS REQUESTED, ON SEVERAL STUDS.

THE LATTER ADDITION WAS TRIED DURING THE 15 MAN PRELIMINARY TRYOUT BUT ABANDONED AS TOO RISKY AS FAR AS RELIABILITY OF SCORING WAS CONCERNED. A CAREFUL PILOT STUDY EMPLOYING SEVERAL TORQUE WRENCHES AND A SETTING-UP OF NORMS FOR DIFFERENT EXAMINERS WOULD BE NECESSARY BEFORE USING THIS TYPE OF ITEM.

EQUIPMENT LIST

- A) MINE CASE, IN THIS RESEARCH THE MINE CASE EMPLOYED AT STATION 8 WAS USED
- B) TORQUE WRENCH (SPRING BAR TYPE)
- C) SPEED SOCKET WRENCH WITH APPROPRIATE SOCKET
- D) NEW GASKET FOR NOSE-FILLING HOLE
- E) DAMAGED GASKET FOR NOSE-FILLING HOLE

CONFIDENTIAL

CONFIDENTIAL

COMPONENT MODIFICATION

NONE OTHER THAN DAMAGING A GASKET. THE ONE USED IN THIS RESEARCH ALSO HAD PAINT ON IT SINCE IT WAS INSTALLED WHILE THE MINE CASE WAS BEING PAINTED.

PERSONAL DATA SHEET

THE FOLLOWING FORM LABELED CRITERION PERFORMANCE TEST FOR MINEMEN WAS PRESENTED TO EACH MINEMAN AFTER HE HAD HEARD THE ORIENTATION TALK GIVEN BY THE EXAMINER IN CHARGE. EACH MAN WAS GIVEN A CHANCE TO EXAMINE IT AND TO BEGIN FILLING IT IN BEFORE STARTING HIS FIRST STATION. THE "FILLING IN" PROCESS WAS CONTINUED DURING WAITING PERIODS BETWEEN STATIONS, AND THE FORM WAS COLLECTED WHEN THE MINEMAN FINISHED HIS LAST STATION.

CONFIDENTIAL

CONFIDENTIAL

CRITERION PERFORMANCE TEST FOR MINEMEN

IDENTIFYING INFORMATION

NAME (PRINT IN CAPITAL LETTERS) _____
 LAST FIRST MIDDLE

AGE (LAST BIRTHDAY) _____

SERVICE NUMBER

PRESENT RATING

TIME IN NAVY _____ AND _____
YEARS MONTHS

WHAT OTHER RATES, IF ANY,
HAVE YOU HELD BESIDES MN?

CIVILIAN EMPLOYMENT HISTORY

(START WITH MOST RECENT JOB)

JOB TITLE	WHAT DID YOU DO?	HOW LONG (MONTHS)

CIVILIAN EDUCATIONAL HISTORY

NUMBER OF FULL SCHOOL YEARS COMPLETED:

GRAMMAR SCHOOL (FIRST 8 YEARS OF SCHOOLING)

HIGH SCHOOL _____ HIGH SCHOOL MAJOR _____

COLLEGE	COLLEGE MAJOR
---------	---------------

OTHER (INCLUDE NIGHTSCHOOL, TRADE SCHOOL, CORRESPONDENCE SCHOOL, ETC.)	
YEARS	TYPE OF COURSE

CONFIDENTIAL

CONFIDENTIAL

NAVY SCHOOLS SUCCESSFULLY COMPLETED

SCHOOL	COURSE	YEAR

NAVY EXPERIENCE AS MINEMAN

GIVE THE FOLLOWING INFORMATION AS NEARLY CORRECTLY AS YOU CAN.

MINE	NUMBER OF TIMES ASSEMBLE OR DISASSEMBLE	DATE WHEN LAST DONE	OPERATIONAL TEST NUMBER OF TIMES DONE	DATE WHEN LAST DONE
MARK 10 MOD 3, 5, 7, 9				
MARK 12-3				
MARK 13-6 OR 25-3				
MARK 25-0 OR 39-0				
MARK 25-1 OR 36-2				
MARK 25-2 OR 36-3				
MARK 26-1 OR 36-1				

FIRING MECHANISM	NUMBER OF TIMES TESTED	DATE WHEN LAST DONE	FIRING MECHANISM	NUMBER OF TIMES TESTED	DATE WHEN LAST DONE
A-3			M-5		
A-5			M9-0		
A-6 AND A-8			M9-1		
M-3			M-11		

YOU MAY USE THE OTHER SIDE OF THIS PAGE TO REPORT ANYTHING ELSE ABOUT YOUR EXPERIENCE THAT HAS CONTRIBUTED TO YOUR ABILITY AS A MINEMAN.

CONFIDENTIAL

CONFIDENTIAL

APPENDIX C

STATISTICAL DATA

CONFIDENTIAL

CONFIDENTIAL

APPENDIX C

STATISTICAL DATA

SOME COMMENT IS NECESSARY CONCERNING SOME OF THE CHARACTERISTICS OF A CRITERION MEASURE DESCRIBED IN CHAPTER II. THIS APPENDIX PRESENTS A SHORT DISCUSSION OF THESE CHARACTERISTICS AS THEY APPLY TO THE MEASURE DEVELOPED IN THIS STUDY. SOME STATISTICS ABOUT THE MEASURE ARE ALSO PRESENTED.

LITTLE FURTHER NEEDS TO BE SAID ABOUT CONTENT VALIDITY. THE COMBINATION OF JOB ANALYSIS, CARRIED OUT IN PREVIOUS STUDIES, AND THE LOGICAL ANALYSIS, DONE IN COOPERATION WITH SUBJECT MATTER SPECIALISTS IN THIS STUDY, CAN BE EVALUATED AND A JUDGMENT ABOUT THE CONTENT OF THE MEASURE MADE. THE DESCRIPTION OF THE ANALYSIS FOR CONTENT IS PRESENTED IN CHAPTER III.

USING THE RAW SCORES OBTAINED FROM THE ADMINISTRATION TO 111 MINEMEN AND THE STATISTICS ON PERSONAL DATA ABOUT THESE MEN, CORRELATIONS WERE COMPUTED. FROM THESE CORRELATIONS ESTIMATES OF CONCURRENT VALIDITY CAN BE MADE. A LOW CORRELATION (.20) WAS FOUND BETWEEN THE TOTAL SCORE MADE ON THE TEST AND GCT SCORE. THIS SUGGESTS THAT DIFFERENCES IN INTELLIGENCE AMONG THE MINEMEN CONTRIBUTED RELATIVELY LITTLE TO THEIR SCORE ON THE CRITERION MEASURE. USING A PAPER AND PENCIL MEASURE THIS LOW A CORRELATION WOULD BE UNLIKELY TO OCCUR. THE CORRELATION BETWEEN THE TOTAL SCORE AND MONTHS OF SERVICE IN THE NAVY WAS .50. SCHOOL GRADES BASED ON THE ELEMENTARY COURSE AT THE U.S. NAVAL SCHOOLS, MINE WARFARE, YORKTOWN,

CONFIDENTIAL

CONFIDENTIAL

VIRGINIA WHEN CORRELATED WITH TOTAL SCORE YIELDED .54.

NO DATA ARE PRESENTED ON THE RELIABILITY OF THIS CRITERION MEASURE. THE USUAL COMPUTATIONS OF TEST RELIABILITY HAVE NOT BEEN DONE, SINCE SUCH COMPUTATIONS ARE MEANINGLESS FOR THIS KIND OF MEASURE. THIS IS SO BECAUSE OF THE DIVERSITY OF THE STATIONS AND OF THE ITEMS WITHIN THE STATIONS. WHAT IS NEEDED, AND THIS IS SUGGESTED FOR POSSIBLE FUTURE RESEARCH, IS THE TEST-RETEST METHOD OF ASCERTAINING RELIABILITY. SUCH A PROCEDURE WOULD RESULT IN TWO MEASURES OF RELIABILITY WHICH ARE IMPORTANT:

(1) EXAMINER CONSISTENCY, AND (2) ITEM CONSISTENCY.

THE CORRELATIONS OF EACH OF THE STATION SCORES WITH THE TOTAL CRITERION SCORES, AS WELL AS THE THREE DIAGNOSTIC SCALE SCORE CORRELATIONS, WHICH WILL BE FOUND IN THE COLUMN LABELED T_C , HAVE BEEN CORRECTED FOR OVERLAP USING THE FORMULA:

$$r_{\text{corrected}} = \frac{r_{xy} \sigma_x - \sigma_y}{\sqrt{(\sigma_x)^2 + (\sigma_y)^2 - 2r_{xy}(\sigma_x)(\sigma_y)}}$$

TABLE 2 ALSO CONTAINS THE INTERCORRELATIONS OF THE STATION SCORES. THAT THEY ARE NOT OF GREAT MAGNITUDE, IN THE MAIN, IS A FUNCTION OF THE STATION DIVERSITY. THIS IS TO BE DESIRED IN A MEASURE SUCH AS THE ONE DEVELOPED IN THIS RESEARCH. THE CORRELATIONS OF STATION 9 WITH THE REST ARE SOMEWHAT SUSPECT SINCE THAT STATION CONTAINS BUT SEVEN ITEMS WHICH WOULD MAKE FOR LOW RELIABILITY OF THE STATION.

CONFIDENTIAL

CONFIDENTIAL

TABLE 2

CORRELATIONS OF STATION AND DIAGNOSTIC SCALE SCORES WITH TOTAL SCORE AND STATION INTERCORRELATIONS

STATIONS	Tc	STATIONS							
		2	3	4	5	6	7	8	9
1	.56	.272	.315	.178	.347	.283	.226	.263	.306
2	.61		.432	.377	.509	.274	.229	.528	.484
3	.56			.406	.326	.388	.281	.462	.396
4	.42				.302	.127	.235	.222	.198
5	.60					.349	.285	.441	.950
6	.10						.224	.252	.159
7	.33							.114	.090
8	.54								.345
9	.44								
DIAGNOSTIC SCALE	F	.03							
	P	.71							
	W	.70							

CONFIDENTIAL

CONFIDENTIAL

TABLE 3

SUMMARY OF THE LEVEL OF SIGNIFICANCE OF ITEMS MAKING UP THE STATIONS OF THE CRITERION MEASURE

STATION NUMBER	NUMBER OF ITEMS IN STATION	NUMBER OF ITEMS SIGNIFICANT		PERCENT OF ITEMS SIGNIFICANT AT OR ABOVE .05 LEVEL	INSIGNIFICANT ITEMS
		.01 LEVEL	.05 LEVEL		
1	31	12	6	58	13
2	18	13	3	89	2
3	15	12	0	80	3
4	13	3	1	31	9
5	19	16	2	95	1
6	21	9	2	52	10
7	19	8	1	47	10
8	17	15	1	94	1
9	7	3	0	43	4
TOTAL	160	91	16	67	53

TABLE 3 SHOWS A SUMMARY OF THE SIGNIFICANCE LEVEL OF THE ITEMS MAKING UP EACH STATION. THE INDIVIDUAL ITEMS AND THEIR CHARACTERISTICS HAVE BEEN PRESENTED IN APPENDIX B. IN TABLE 3 THE TOTAL NUMBER OF ITEMS IN EACH STATION AND THE NUMBER OF ITEMS SIGNIFICANT AT THE .01 AND .05 LEVEL OF CONFIDENCE ARE SHOWN. THE NEXT TO THE LAST COLUMN PRESENTS THE PERCENT OF ITEMS IN EACH STATION WHICH WERE AT OR ABOVE THE .05 LEVEL. THESE ARE REFERRED TO IN THE "SUGGESTED CHANGES" SECTIONS OF APPENDIX B AS SIGNIFICANT. THE LAST COLUMN OF TABLE 3 SHOWS THE NUMBER OF ITEMS WHICH WERE INSIGNIFICANT.

IN MAKING INTERPRETATIONS OF CORRELATIONS INVOLVING MINEMEN'S SCORES IT SHOULD BE KEPT IN MIND THAT THE EXAMINERS KNEW THE MAN'S PAY GRADE WHILE THEY WERE EVALUATING HIM. THIS KIND OF CRITERION CONTAMINATION IS DIFFICULT TO AVOID SHORT OF DRESSING ALL MEN ALIKE, AND USING EXAMINERS WHO HAVE HAD NO PREVIOUS CONTACT WITH THE SUBJECTS.

ANOTHER PROBLEM, WHICH WAS ANTICIPATED AND WHICH DEVELOPED, WAS THAT OF PASSING INFORMATION. SOME INFORMATION WAS PASSED FROM MEN WHO HAD FINISHED THE STATIONS TO THOSE WHO TOOK THEM LATER. THE INFORMATION PASSED UNDOUBTEDLY INFLUENCE FACT ITEMS MORE THAN PERFORMANCE ITEMS. NO EVIDENCE IS AT HAND WHICH SUGGESTS A DIFFERENTIAL RATE OF INFORMATION PASSING FOR THE PAY GRADES.

UNCLASSIFIED

UNCLASSIFIED